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**Northern
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Report No. 8

Cultural Resources

The Log Chutes of North Idaho

by
Cort Sims

THE LOG CHUTES OF NORTH IDAHO

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1. Introduction

Winding through the forests of north Idaho are hundreds of miles of rotten logs spiked to wooden cross ties. These structures, called log chutes, were once the most important element of north Idaho's transportation system for the logging industry. As a general definition, any timber channel in which logs are transported can be considered a log chute.

This paper examines the development, characteristics, and use of log chutes in north Idaho. The purpose of this paper is to provide enough information to allow log chutes to be managed as an historical resource. This paper is also intended to direct future fieldwork into areas which are in need of further investigation or areas which promise some understanding of history.

2. Development of Log Chutes

Logging in the United States began with the arrival of the first European settlers. As the forest resources were depleted in one area, logging interests searched out new stands of timber. In the 1820's and 1830's, the logging frontier was centered in the State of Maine. By the 1850's, the frontier had moved west to the Great Lakes Region (Wood 1935:226ff). In the late 1800's, the logging frontier had fully enveloped the Pacific Coast (Williams 1976:48ff), largely bypassing the Rocky Mountains.

The lack of transportation and the difficult terrain discouraged development of the Rocky Mountain timber resources. This situation began to change at the end of the nineteenth century.

> By the turn of the century, the supply of old-growth white pine was virtually exhausted in the New England and eastern states, and was shrinking rapidly in the lake states. Large sawmills, employing band saws and resaws, were ripping out the lumber at an unprecedented rate. New fields for future operations appeared to be essential if the industry was to survive. Accordingly, many concerns dispatched agents, men widely experienced in the business of evaluating timber stands, to size up the white pine forests of north Idaho... (Strong and Webb 1970:4).

The production of lumber in north Idaho skyrocketed beginning in about 1900, with 72 major sawmills operating in Kootenai, Benewah, and Shoshone counties alone by 1910 (Strong and Webb 1970:177-8).

In the early years of logging, trees were cut and hauled by hand. By the time the logging frontier had reached Maine, logs were transported by sleigh in the winter to rivers to be carried to mills on the spring floods. Sleighs also dominated the transport of logs in the Great Lakes Region, but on the Pacific

Coast other types of technology were required to transport logs. The steep terrain, large logs, and lack of snow in many areas prevented the use of sleighs. In the beginning "skidroads" were used. These skidroads consisted of logs laid crosswise, partly buried in the ground, at intervals of a few feet in a dirt road. The logs being transported would be pulled over this road with teams of oxen. Skidroads served well for the more accessible timber but, as Williams points out, in mountainous county other methods were required.

> For all its ingeniousness, the skidroad had its limitations: it could not work on a hill whose gradient was too steep for the oxen, and it could not be more than a couple of miles long because not even the doughtiest of animals were strong enough to pull the heavy logs very much further... Loggers wracked their brains for fast, effective ways to move the big sticks down from the heights. The log chute, a spectacular device, was the first that did not rely primarily on the muscle power of men or beasts... The principle behind the chutes was simplicity itself: since the course was downhill, let gravity do most or all of the work. In essence, the chutes were long troughs, usually made of peeled tree trunks, that served as conduits for the logs (1976:99-102).

Log chutes originally were developed in Europe. The idea was probably brought to the United States by the hundreds of Scandinavian immigrants imported into the logging camps in the 1800's. Williams (1976:102) notes that log chutes were in use in the far western United States by the late 1850's. From this period log chutes were used extensively either by themselves or, more often, in conjunction with other log transport methods. Horses, steam donkeys, railroads, flumes, wagons, sleighs, and caterpillars were used in conjunction with log chutes over the years.

In the early 1930's log chutes were in use in the northern and central Rocky Mountains, the northeastern United States, southern Appalachian hardwoods, and in eastern Canada (Brown 1934:118-120). Improvements in roads and equipment,

especially trucks, in the 1930's rapidly caused the abandonment of the use of log chutes in north Idaho. By 1940 no log chutes were being used in the Idaho Panhandle (Strong and Webb 1970:115).

3. Physical Properties of Log Chutes

The physical principles behind the operation of log chutes are fairly simple. The force of gravity is employed to move or assist the movement of logs down a chute. The force of friction acts in an opposite direction to the movement of the logs down the chute. Finally, the log chute itself exerts a force (called normal force) perpendicular to its surface against moving logs which keeps the logs in the chute (Von Almburg 1911:161ff). These principles conform to some basic laws of physics which are worth reviewing in a very general way.

The force of gravity causes objects dropped near the surface of the earth to fall with the same acceleration as in a vacuum. As everyone knows, Newton propounded a law which explains the acceleration of an object under force. Without going into a technical discussion of Newton's Second Law of Motion, it can be stated that acceleration will be proportional to force and inversely proportional to mass (Giancoli 1980:39).

The force of friction results when two surfaces rub against one another. No surface is perfectly smooth, so the irregularities in a surface will come to oppose irregularities in another surface rubbing across it. No less a man than Leonardo da Vinci first observed that the force of friction is proportional to the perpendicular force that one surface exerts on another. Thus, there is no significant connection between the force of friction and the total area of contact between two surfaces (Giancoli 1980:47). As in many areas of the physics of force, the force of friction is only partly understood (Sears and Zemansky 1964:33).

The roughness of two surfaces being rubbed together changes what is technically called the "coefficient of friction". This coefficient is different for a standing object (static) and an object in motion (kinetic). The coefficient for kinetic friction is usually less than for static friction. Thus, it would take more force to get an object started to slide than to keep it in motion. For a wood surface sliding on another wood surface the approximate coefficients of friction are: 0.4 for the static figure and 0.2 for the kinetic figure (Giancoli

1980:47). Figure 1 illustrates the relationship of normal force, the force of friction, and the force of gravity as it would relate to a log chute.

The speed at which the log will accelerate in a chute can be found by using the following formula:

a = acceleration in meters per second squared.
g = the acceleration of gravity (9.8 m/s^2).
s = angle of slope.
c = coefficient of friction.

$$a = g (\sin s - (cg)(\cos s))$$

For a log in motion down a wooden chute on a 30^o slope, the acceleration would be (0.50 - (1.98)(0.866) 9.8 = 11.9 m/s^2. In five seconds the log would be traveling (11.9 m/s^2)(5.0 s) or 59.5 m/s (Giancoli 1980:50).

Another useful relationship occurs when the tangent of the slope equals the coefficient of kinetic friction. This is the point at which a log will slide at a constant speed once in motion and below which, without an assisting force other than gravity, it will come to a stop (Sears and Zemansky 1964:38).

An additional area which should be reviewed is that of "momentum". The momentum of a moving object is defined in physics as the mass times the velocity. Thus, the momentum of a log sliding down a chute can be found by multiplying the weight by the speed. Momentum is a directional force. A change in the momentum of a log is proportional to the amount of the net force applied to it. This relationship is important to understanding what happens when a sliding log encounters an obstruction or irregularity in a log chute. The momentum is changed in proportion to the net force which is the sum of all forces acting on it. This means that the direction of a log's movement down a chute can be altered by encountering a normal force from an irregularity in the chute. The new direction will be the sum of the momentum and the normal force.

Any effort to slow logs down must be applied symetrically or the logs will tend to cartwheel. Just as a speeding car in which only one front break engages, a log hitting an obstruction on one side of the chute will turn out of the chute.

So far we can calculate the point at which a log will slide in a chute at a constant speed, the acceleration of a log on slopes of various angles, and have some idea of the concept of momentum. Once in motion, a log would have a tendency to travel in a straight line. This tendency is called "inertia". To overcome inertia and move a log in a curved log chute, a sideways force is required. This is sometimes called "centripetal force". The force needed to turn the log can be calculated in the following manner:

N = unit of force.
f = force required to accelerate the log around a curve.
m = mass in kilograms.
v = velocity in meters per second.
r = radius of curve in meters.

$$f = m\frac{v^2}{r} = N$$

A 100 kg log traveling 59.5 m/s in a log chute with a 100 meter radius curve equals a net force of 1190N. The net force exerted on the log by the chute is equal to the weight times the force of gravity, (w)(g) or (1000 kg)(9.8 m/s^2) = 9800N. With a coefficient of kinetic friction of 0.2, the maximum force of friction would be 1960N. The force of friction would be overcome by inertia and the log would jump the chute (Giancoli 1980:67).

A way to compensate on tight curves and keep the logs in the chute is to bank the curve so that part of the normal force will be toward the center of the curve. Giancoli (1980:68) notes that for every angle of banking there is a speed at which no friction is needed to provide centripetal acceleration. This can be found by taking the normal force times the sin of the banking angle. In

the above problem if the chute was banked 12^{o} with a normal force of 9800N, a force of 2037N will be provided without the need of the force of friction. Thus, the log would stay in the chute.

This technical discussion, while difficult to grasp at first reading, provides an accurate way to evaluate the information obtained on the construction and use of log chutes in the past. In-depth treatment of these topics can be found in any introductory physics text.

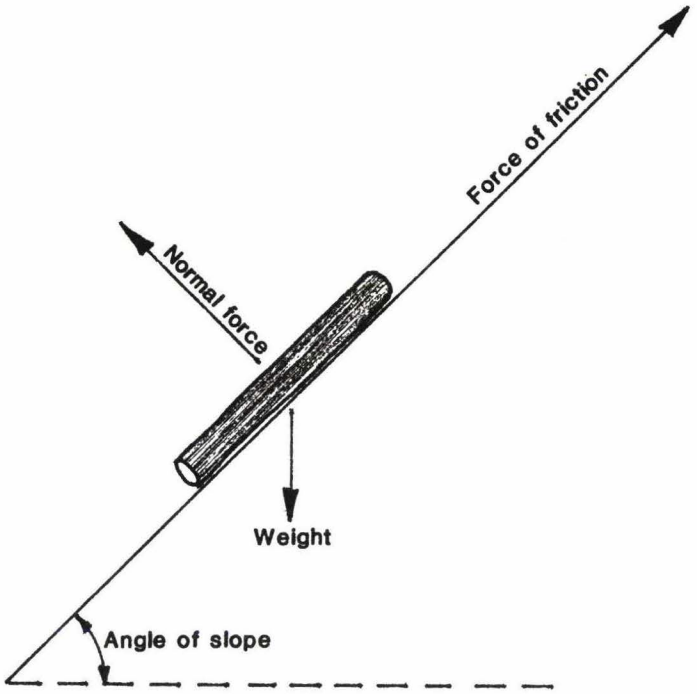


Figure 1, The relationship of normal force, the force of friction, and the force of gravity on a sliding log.

4. The Parts of a Log Chute

There were several types of log chutes built in north Idaho. More than 95 percent of the ones built in north Idaho were the "hewed two-pole" type (Neff 1927:38). Other types which were only very occasionally used included the three-pole chute, the ground chute, the saw-timber chute, and the roller chute (Neff 1927:38). In this paper, the discussion will concentrate on the history of two-pole hewn chutes because it was this type of chute that had the only real importance in north Idaho.

A two-pole hewn chute consists of two log rails (called chute sticks or chute timbers) laid side-by-side and spiked to cross ties. The interior sides of the chute sticks are hewn at an angle so that they form a "V" shaped channel. The beginning of the chute was sometimes called the "head", the chute proper was occasionally called the "slip", and the terminus of the chute was called the "apron" in some areas.

At the head of a chute, there were usually a series of "skidways." These structures consisted of two parallel log skids perpendicular to the chute sticks. The ends of the skids butted against the outside edge of one chute stick and the tops of the skids were slightly elevated above the tops of the chute sticks (Figure 3). Logs were piled on the skidways where they were stored until they were loaded into the chute. Logs were generally brought to the skidway by skidding the logs over the ground with a team of horses. Occasionally skidways consisted of a series of parallel skids each elevated slightly above the other (Figure 3).

The chute sticks were generally joined by a simple lap joint. The chute sticks were between 9 to 18 inches in diameter and were spiked with 12-inch long, 3/4-inch square chute spikes. When the chute stick had a greater diameter than the length of the spikes, the spikes were inset in notches cut into the outer sides of the chute sticks (Figure 2). The cross ties (sometimes called cross skids or crossers) support the chute sticks at an interval ranging from 8 to 16 feet. In

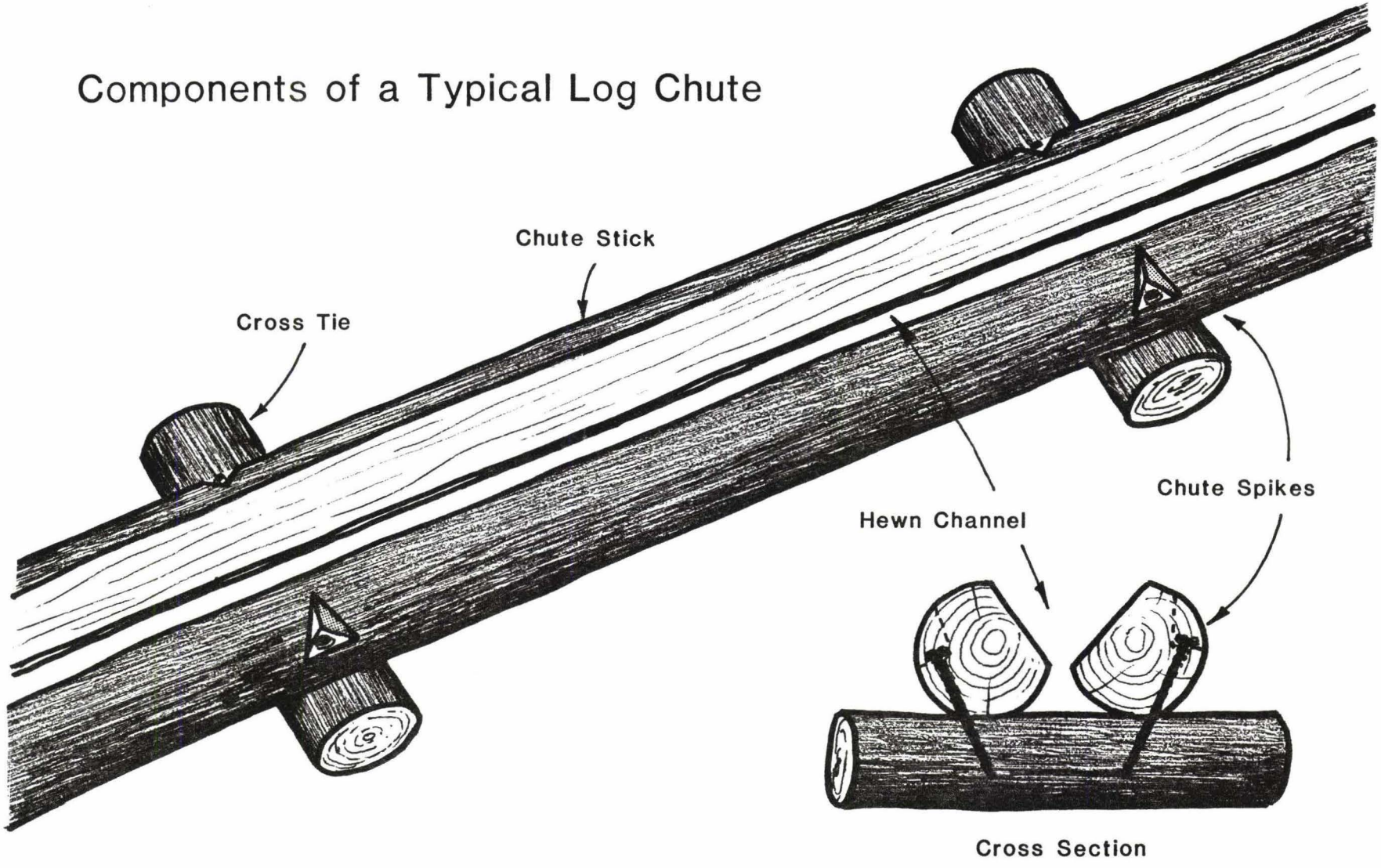

Components of a Typical Log Chute
Chute Stick
Cross Tie
Hewn Channel
Chute Spikes
Cross Section

Figure 2

some cases chutes were constructed without crossties. In this type of chute the chute sticks are embedded in the ground with occasional perpendicular supports to keep the logs in place (Figure 13).

Along the chutes there would often be a number of auxiliary structures. When the chute passed over a depression or low area, a crib framework was used to support the chute sticks (Figures 19, 20, 21, and 23). On sharp curves the hewn channel could be banked by using a crib framework to elevate the outer chute stick (Figures 13 and 23) or fender poles could be attached to the top of outer chute stick (Figure 22). Cribbing consists of a rectangular framework of notched logs and is the simplest type of structural support. Trestle-type supports used less wood but were more difficult to build. To our knowledge, trestle-type supports were seldom, if ever, used in conjunction with log chutes.

Log chutes with little or no gradient required some means to pull the logs along the chute. The pulling power was generally supplied by horses (Figures 7, 8, and 9), but tractors (Figure 14) and steam donkeys (Figure 11) were also used. For horses and tractors, a tow path was constructed along one side of the chute. This tow path was generally just a wide dirt trail. In areas where the ground was very broken or swampy, the tow path was paved with logs laid down horizontal to the direction of the chute. This log covering formed a "corduroy road" (Figure 10). Tow paths were also constructed with logs parallel to the direction of chute and with earth fill.

On chutes with a steep gradient where logs were propelled by the force of gravity, various mechanisms were installed to slow the descent of the logs. These mechanisms included goosenecks, chain riprap, railroad spikes, and bear traps. Some chutes might employ one of these devices while others would use a combination of them to slow the speed of the logs (Figure 32).

A gooseneck (also goose-neck and goose neck) was a hand-forged, 1-1/2-inch to 2-inch square, recurved iron bar with a chisel point. As Bryant (1913: 240) explained, goosenecks are

> ...placed in holes bored through the slide timbers and as the logs pass over them, the prongs bite into the wood and retard the progress. Logs will leave the slide unless the goose-necks are placed opposite each other. The holes in which the goose-necks are fitted are bored entirely through the slide timbers so that dirt cannot accummulate in them. When not in use the goose-necks may be removed or dropped into notches cut into the slide timbers for that purpose.

Figure 29 shows the shape and placement of a common form of gooseneck. Figure 39a shows a gooseneck from north Idaho and Figure 12 shows two goosenecks in place in a log chute. Railroad spikes were occasionally used in the same manner as goosenecks. They were set into the chute in groups of 2 or 4 and took less of a bite out of passing logs (Anderson 1930:202).

Chain riprap or "roughlocks" consist of chain secured to the sides of the log chute channel. As one old-time chute builder remembers

> The logs run over that chain, tear the bark off, and then the bark would get in and kind of like sand in the chute, and it would impede the progress of the logs (Barton 1980:232).

Little mention is made of chain riprap in either the literature or the oral history. However, this may be more a result of a consistent oversight on the part of interviewers and authors than the lack of use of chain riprap.

"Bear traps" were constructed in a fashion similar to dead falls used to kill bears. Figure 30a illustrates a bear trap on a slide in Europe. Bryant (1913: 240) describes a bear trap as consisting

> ...of a log, one end of which is pivoted to a framework erected above the slide. The free end is armed with spikes that drag on the logs as they pass under them.

To withstand the impact of large, fast-moving logs, a bear trap would have to be very substantially constructed. The extent of the use of bear traps was not recorded, but in 1930 I. V. Anderson (1930:202) advocated a greater utilization of this device.

At the terminus or apron of the chute there were several methods of unloading the logs. Where the logs were running by the force of gravity, it was common to end the chute at a pond. The logs simply leave the end of the chute and enter the water. The water in the pond would stop the logs where they could then be stored until they were moved to a mill by some other means of transport (Figures 25, 26, and 27).

Chutes could also be unloaded from the side by several methods. Bryant (1913: 233) states that:

> A common method of dumping logs from a slide is to build one side several inches lower than the other. Another method used where there are several dumping grounds is to hew down the side of the slide on the dump side and place a switch called a "whip-poor-will" diagonally across the slide timbers. The lower part of the slide ends at a landing, where the grade should be level or slightly ascending to check the speed of the logs. When the log strikes the switch it is shunted off. When it is desired to send logs past a given dump, the upper end of the switch is removed and placed across the depression on the slide timber and fastened by two heavy tree nails.

This type of switch is illustrated in Figures 24 and 30a.

Logs shunted from the side of a chute, by whatever method, usually dropped onto a rollaway. Like a skidway, a rollaway generally consisted of a platform of parallel logs perpendicular to the chute sticks. This platform was used as a storage area for logs (Figure 24) and a means of transfering logs from chutes to

other forms of transportation such as flumes. The platform was often tilted down from the side of the chute so that logs would roll away from the chute once they were unloaded.

5. Log Chute Construction

The construction of a log chute followed a general sequence of clearing the right-of-way, cutting and placing the cross ties, cutting and spiking the chute sticks, and hewing the channel. When chutes were run by the force of gravity, a 4-foot right-of-way was sufficient. However, if the logs were trailed in a chute, an 8- to 10-foot wide clearing was needed for the chute and the tow path (Bryant 1913:231). A chute usually was kept close to the ground following the bottom of drainages. Neff (1927:38) found that:

> Chutes are generally located in or near the bottom of draws or depressions so that timber may be easily brought down to and rolled into them from both sides. Their location on side hills and sometimes on ridge tops is necessary, however, where the timber is so situated or the topography so broken that they will not serve their purpose effectively otherwise.

Dooley Cramp, who built log chutes in north Idaho in the 1920's, recalled that:

> ...when we were building chutes we used a 31-foot chute stick. And we'd always put your butts behind and your tops ahead. And then you'd...start at the bottom of your chute and you build up. Because your upper log would always be notched right into that. They all laid all in the line, and in the curve you just make a gradual curve. And you had to crib them up when going over a gully or dip ... (Barton 1980:II,235).

> You build 1000 feet or 2000 feet and then you'd score it and hew it (Barton 1980:II,233).

All of the hewn chutes appear to have been hewn after the chute sticks were secured. A chalk line was used to lay out the channel and this line was scored with a double-bitted ax. Then a broad ax was used to hew a smooth face on each side of the channel.

Chutes were ordinarily constructed of trees with a low market value, such as larch, hemlock, and white fir. In the event these species were not available, a valuable species such as white pine was used. In such a case, the logs would then be taken up and used as sawlogs when the chute was no longer needed.

The chute sticks were joined with the use of a simple lap joint. The joints were preferably not in the same locations on the two parallel chute sticks (broken joints) to increase the strength of the chute (Bryant 1913:232). The joints appear to always be supported by cross ties or rest on the ground. Chute sticks were placed in the chute so they tappered in the opposite direction from the flow of logs. This greatly easied the cutting of the chute channel which was hewn downslope.

The angle of the channel sides were changed in response to the gradient of the chute. Wash Applegate, an experienced chute builder, has observed that:

> It took a master chute builder to flatten out where you had to trail them and steepen the edges where the chute went steep and the logs began to run (Russell 1979:24).

The steeper the channel the greater resistence a log meets when sliding down the chute. Neff (1927:39) provides the following definition of a steep and flat channel slope:

> By "hewing flat or steep" is meant the slope of the hewed plane, center to sides across the cross section. "Flat" is from 20 to 33 percent slope or (1 to 5) to (1 to 3), and "steep" over 33 percent slope. On steep ground they are sometimes hewed as steep as 60 to 70 percent.

Another means of varying the resistance of the chute is to vary the distance between the chute sticks. This distance could vary from 0 to 6 inches. Assuming that the channel angle is constant, the variation in the distance between the chute sticks makes a log ride higher or lower in the channel.

Building curves in log chutes requires a consideration of the length of material to travel over the chute, and the gradient of the slide. Bryant (1913:238) notes that sharp curves on steep slopes cause increased wear on a chute and increased the probability that logs would jump out of the chute. He also points out that it is sometimes necessary

> ...to elevate the outer slide timber, the amount of elevation depending on the degree of curvature, the grade and the character of material that is being transported. A radius less than 200 feet is not desirable for any form of slide (Bryant 1913:238).

The outside chute stick was elevated on a crib framework. This consisted either of an extra log parallel and directly under the outside chute stick (Figure 26) or elevated cross ties, supported by a perpendicular log foundation (Figure 13). To span a depression or low area in the terrain the chute was supported on a crib framework to keep it level (Figure 20).

The factors affecting the construction of log chutes include terrain, size of logs to be transported, and the distance the logs needed to be transported. Another factor, which is not quantifiable but seems very important, is the skill of the chute builders. There were definitely good chute builders and poor chute builders. In north Idaho, some chute builders have almost become legendary because of their skill. John Akerstrom, a chute builder in the 1920's, remembered that

> I began to do a lot of chute building and make good money. In 1922 I got acquainted with top chute builders like Pete Peterson and Alex Smith, at Falls Creek, a branch of Big Creek of the Coeur d'Alene River now called Shoshone Creek... I saw a chute on Carpenter Creek out of Santa which the original Chute Smith built. It was old at the time. He was one of the earliest chute builders (Russell 1979:7).

> I learned a lot from earlier chute builders by asking them questions and looking at old chutes. I knew one chute builder that would build a nicely graded chute into a hump or hollow without ever allowing ahead for it. He couldn't seem to get the feel. It's simple. I used 26-foot sticks of tamarack for chute timbers and laid the next two cross ties ahead of the three already laid down we were spiking the chute timber to. They can be easily lined up with the eye only and that way you can see ahead and allow for the humps and hollows (Russell 1979:8).

Poorly built log chutes would allow logs to jump out or would break apart under the stress of running logs or would excessively damage logs. In 1927 Philip Neff noted that

> Chute location and construction is too often left to employees whose concern is principally for the day's wages and who will probably not be on the payroll when it is necessary to use the chute. Therefore many chutes have to be, or should be, rebuilt on account of improper location or construction (1927:158).

The general impression that the author received from the literature and through interviews with various informants is that people constructing log chutes had to be "logging engineers". That is, they had to know the tolerances of log chutes and how to stay within these tolerances. Most learned this "engineering" on the job. Those that did not learn were not employed long in that profession.

Figure 3, Logs decked on a skidway on the Kaniksu National Forest in 1923.

Figure 4, Skidding logs onto a skidway on the Kaniksu National Forest in 1923.

Figure 5, Trailing logs in a chute with horses on the Kaniksu National Forest in 1923.

Figure 6, Rolling logs into a chute on the Kaniksu National Forest in 1923.

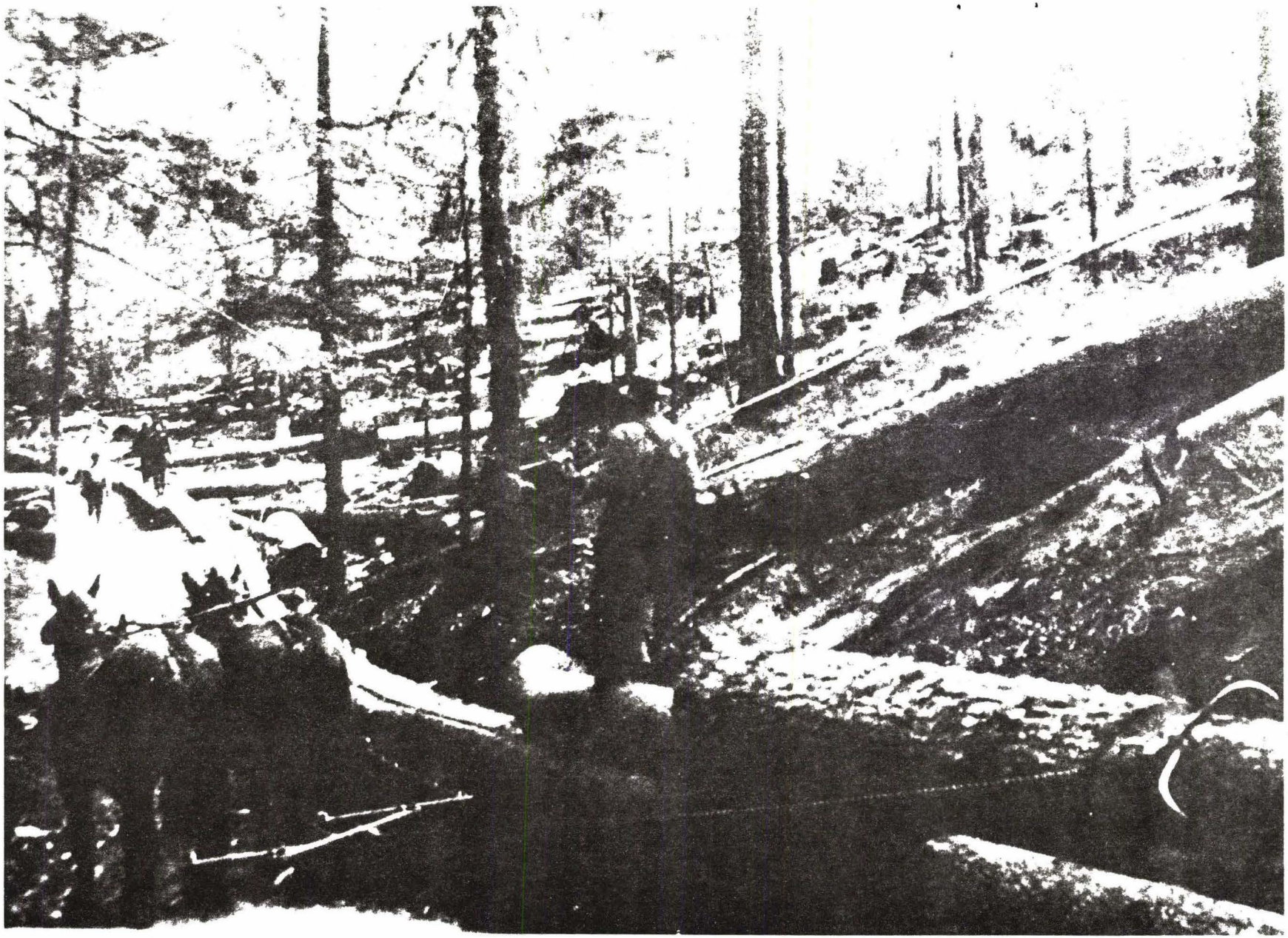


Figure 7, Trailing logs in a chute with tongs on the Kaniksu National Forest in 1925.

Figure 8, Trailing logs with horses on the St. Joe National Forest in 1912.

Figure 9, Trailing logs with horses, place and date unknown.

Figure 10. Log chute with corduroy road on the St. Joe National Forest in about 1911.

Figure 11, Trailing logs in log chutes with the use of a steam donkey in about 1912.

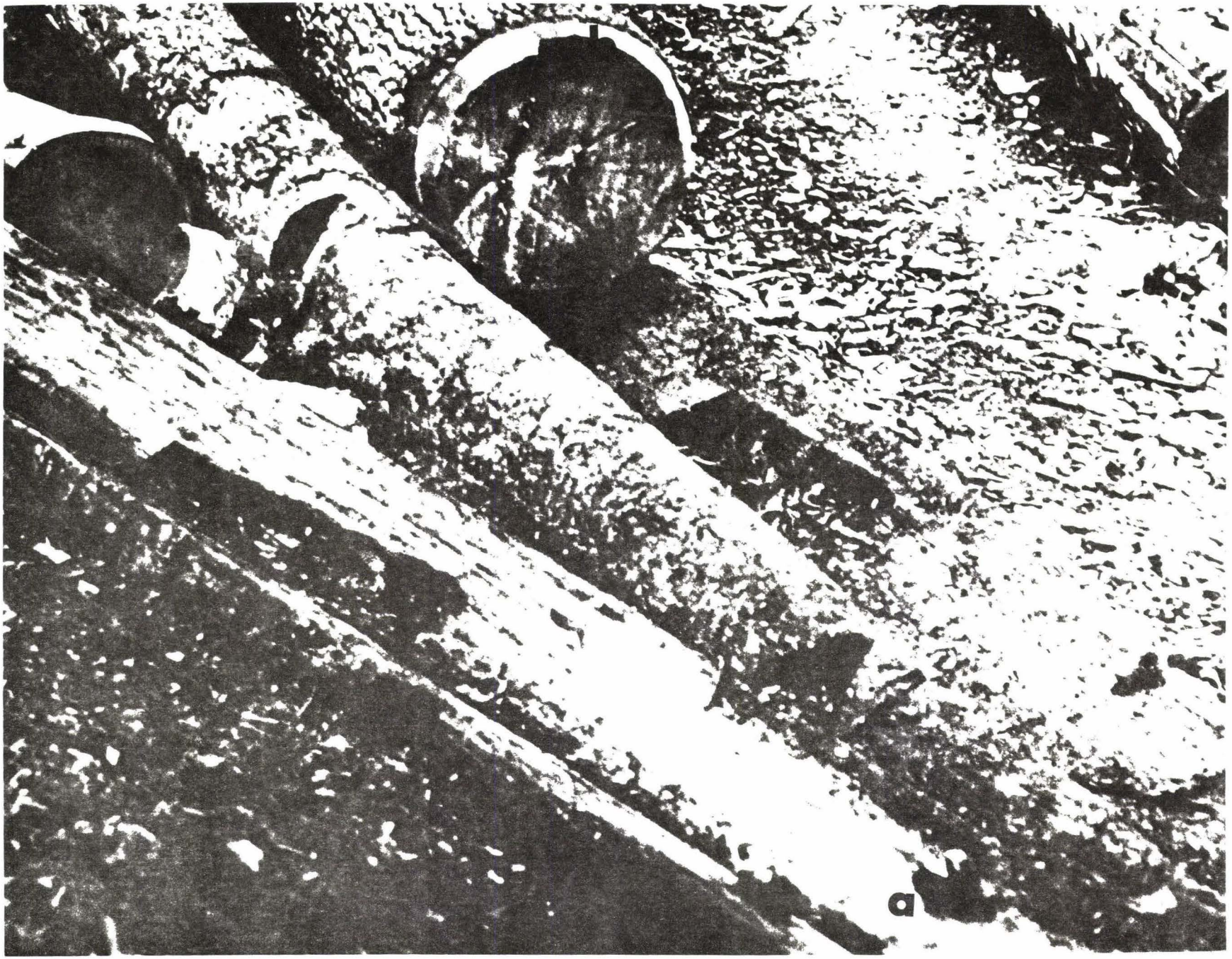


Figure 12, Enlarged area of Figure 11 showing (a) goosenecks in place and (b) "sniped" log.

Figure 13, A banked curve in a log chute with the outer chute stick slightly elevated on the Coeur d'Alene National Forest in 1924.

Figure 14. Trailing logs in a chute with a tractor on the Kaniksu National Forest in 1924.

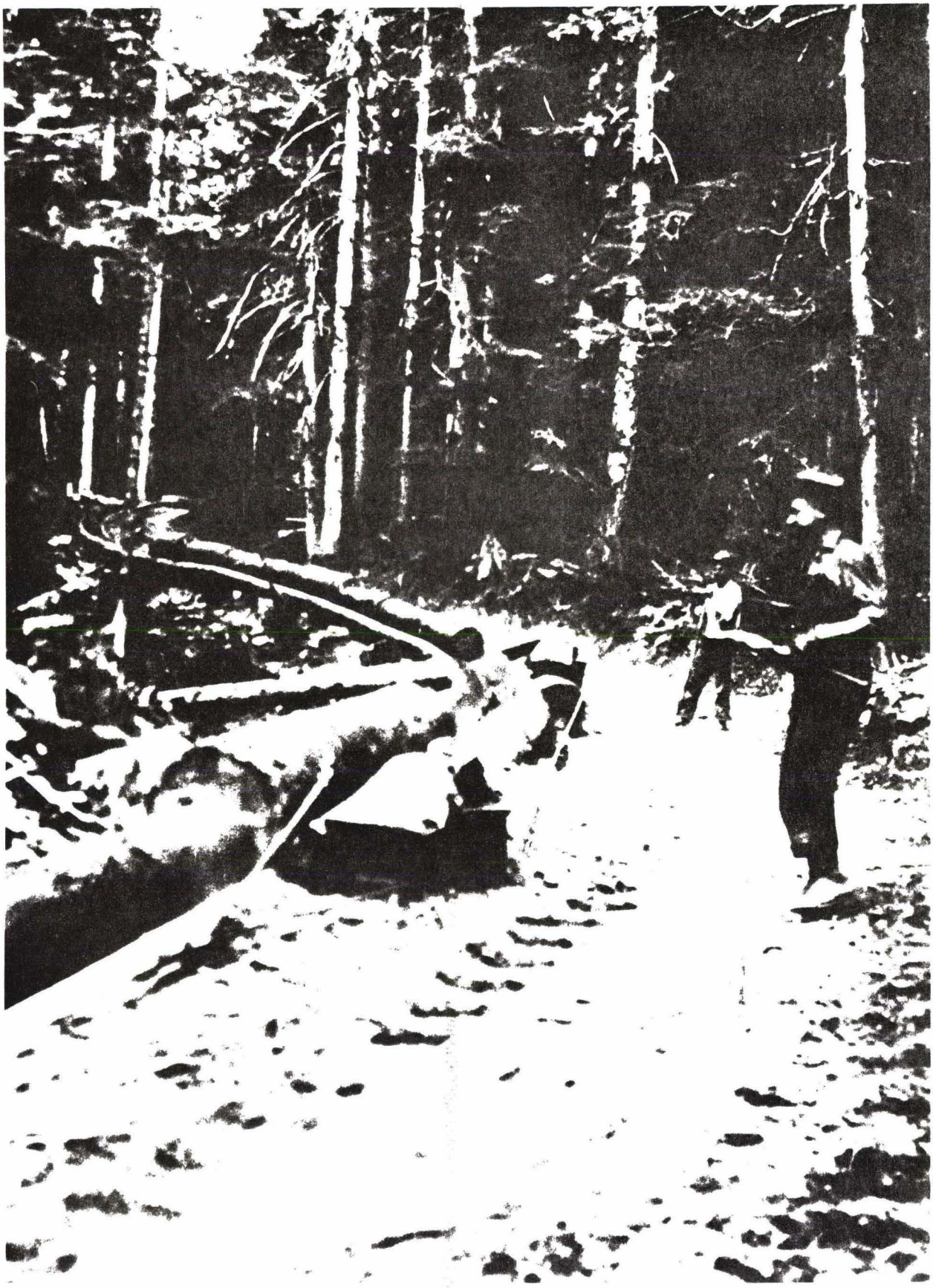


Figure 15. Cable rollers for guiding cables around corners on the Kaniksu National Forest in 1924.

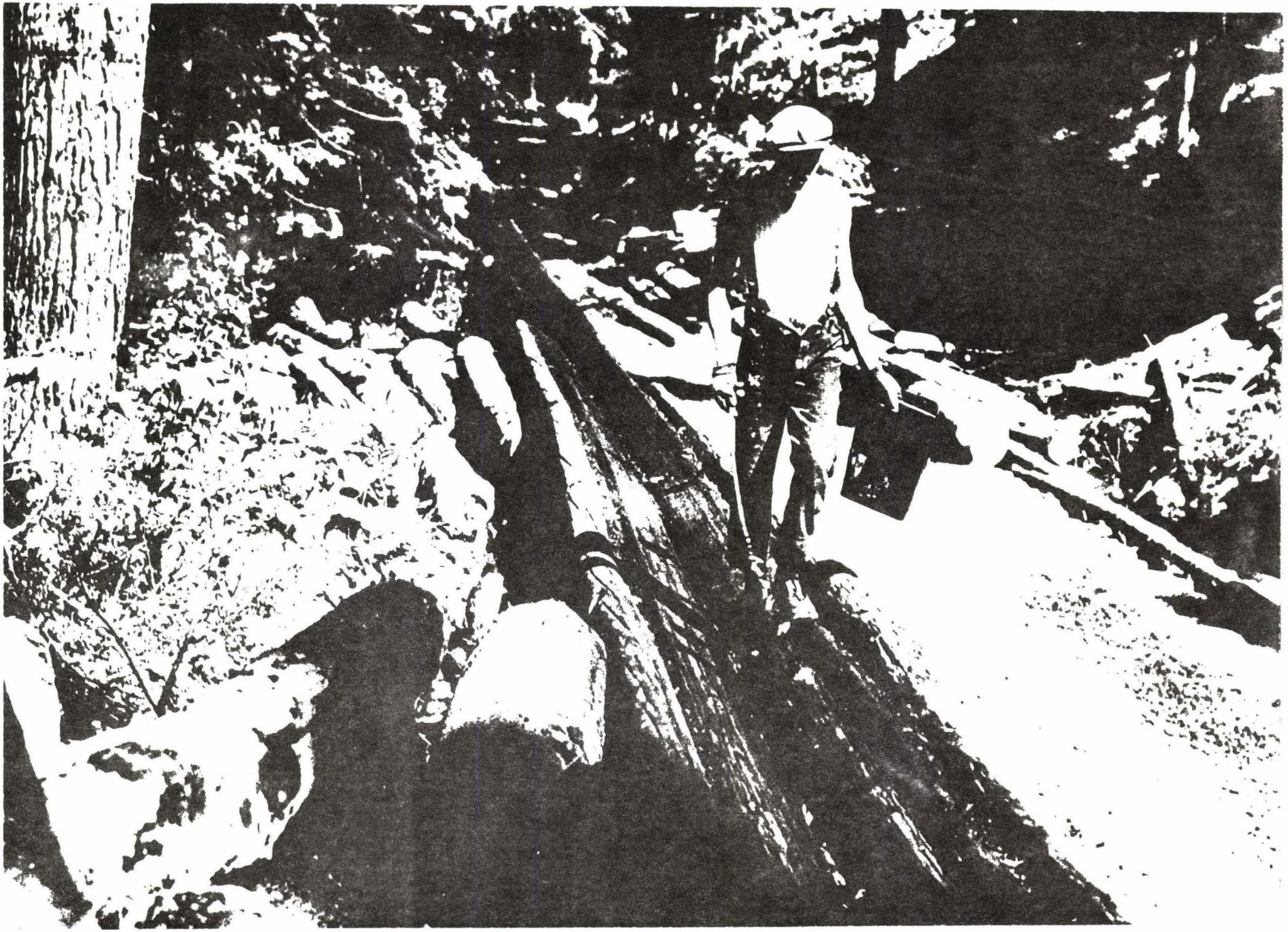


Figure 16, Greasing a chute on the Coeur d'Alene National Forest in 1932.

Figure 17, Greasing a chute on the Pend Oreille National Forest in 1923.

Figure 18, Gravity run log chute on the St. Joe National Forest in about 1925.

Figure 19, Logs sliding down a chute under the force of gravity on the Kaniksu National Forest in 1923.

Figure 20, Log cribbing supporting a log chute on the Kanisku National Forest in 1918.

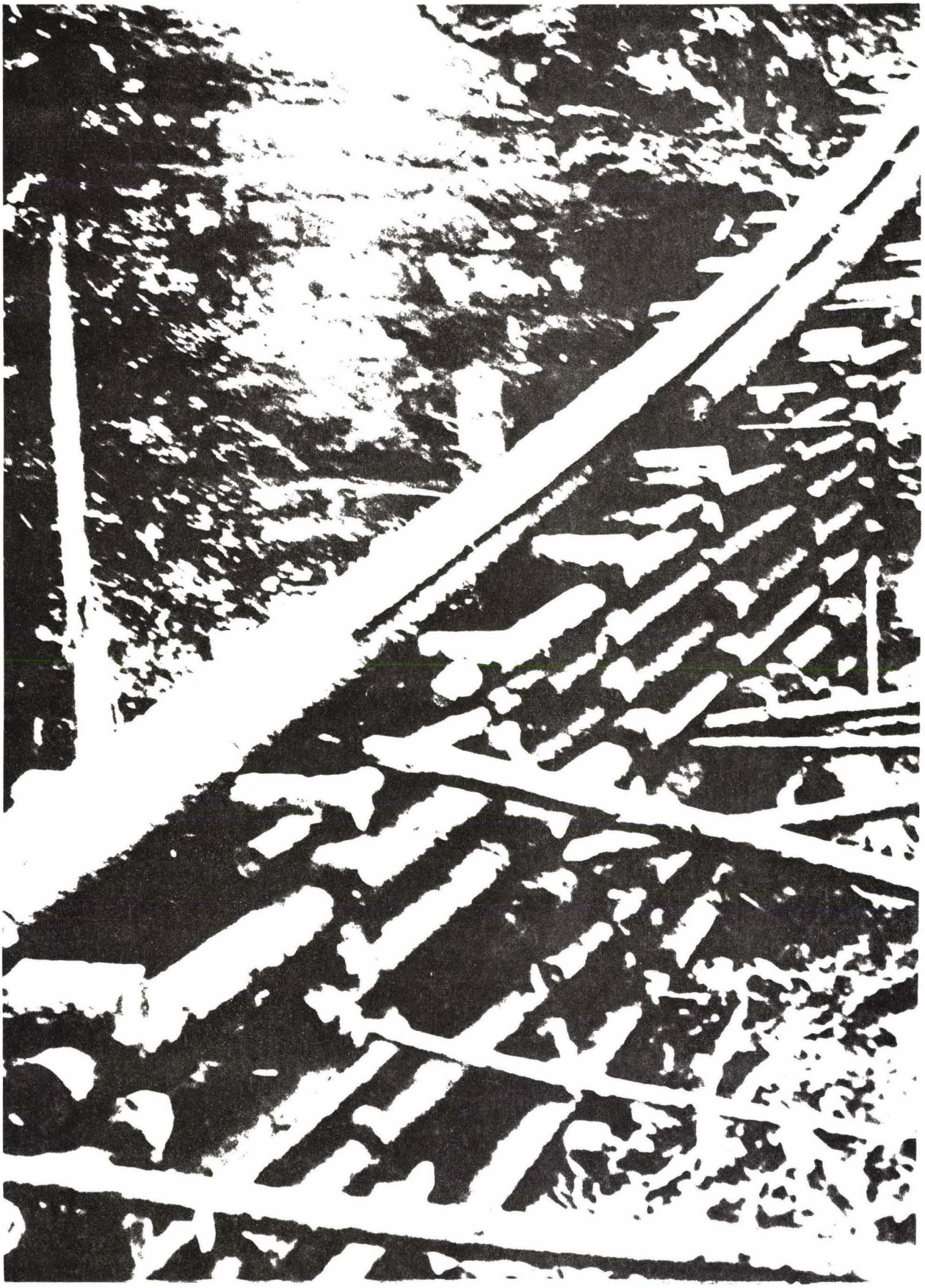


Figure 21, A log chute on a crib support on the Coeur d'Alene National Forest in 1915.

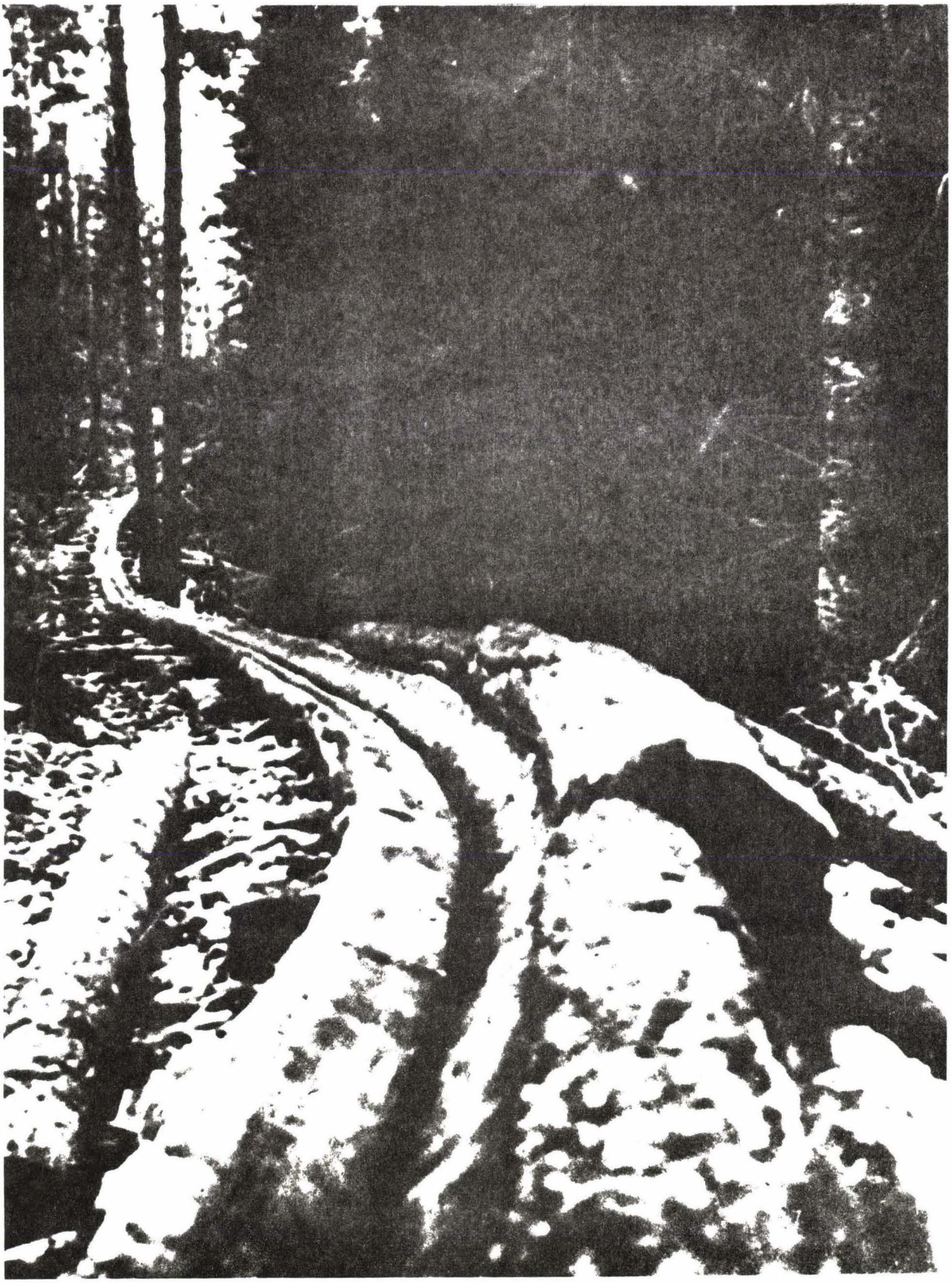


Figure 22. A log chute with fender poles on a curve on the Coeur d'Alene National Forest in 1915.

Figure 23. A banked gravity chute owned by the Rutledge Timber Company, location unknown (Forest History Society).

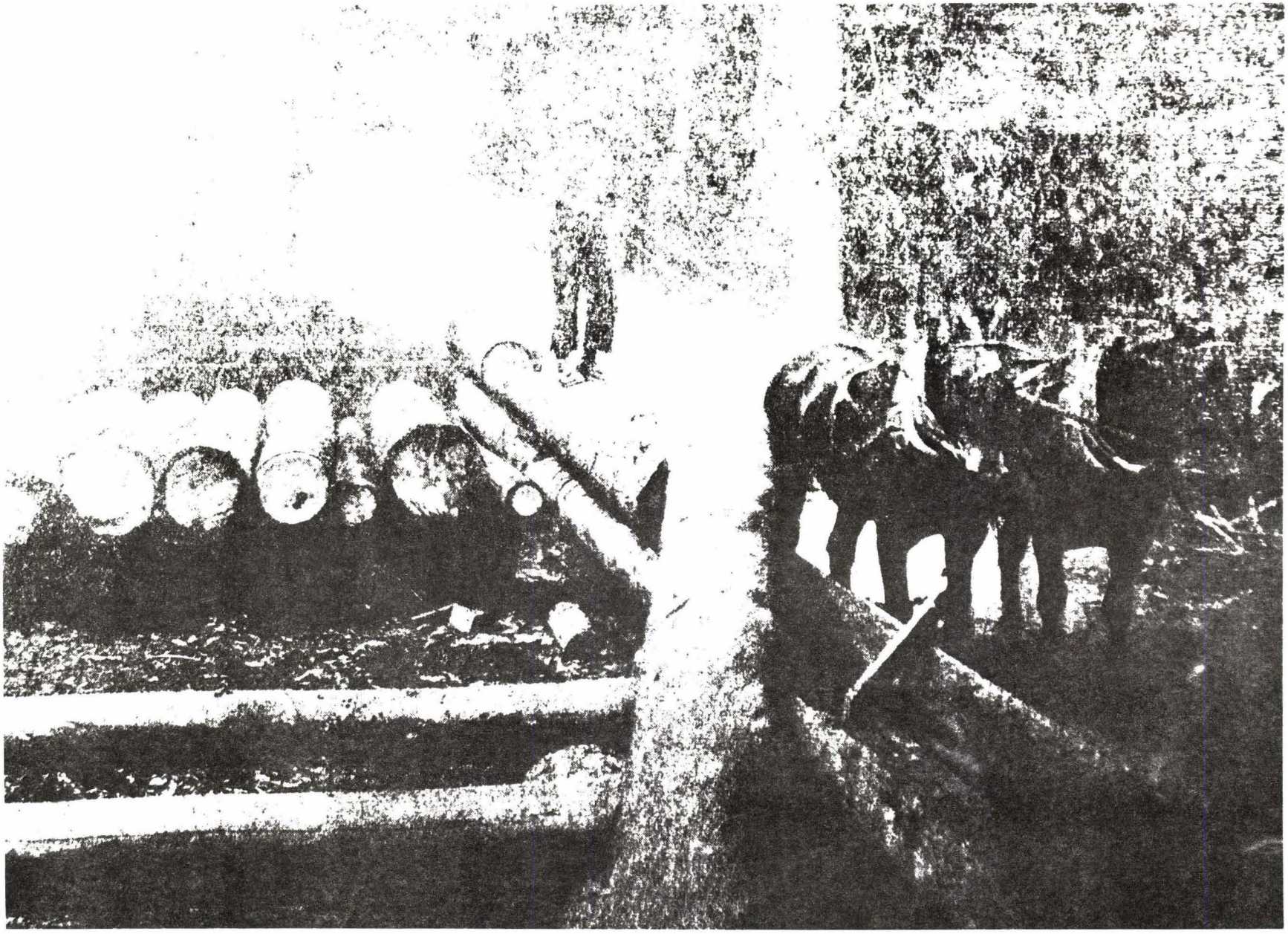


Figure 24, Whip-poor-will in use to unload logs from a chute onto a rollaway on the Kaniksu National Forest (date unknown).

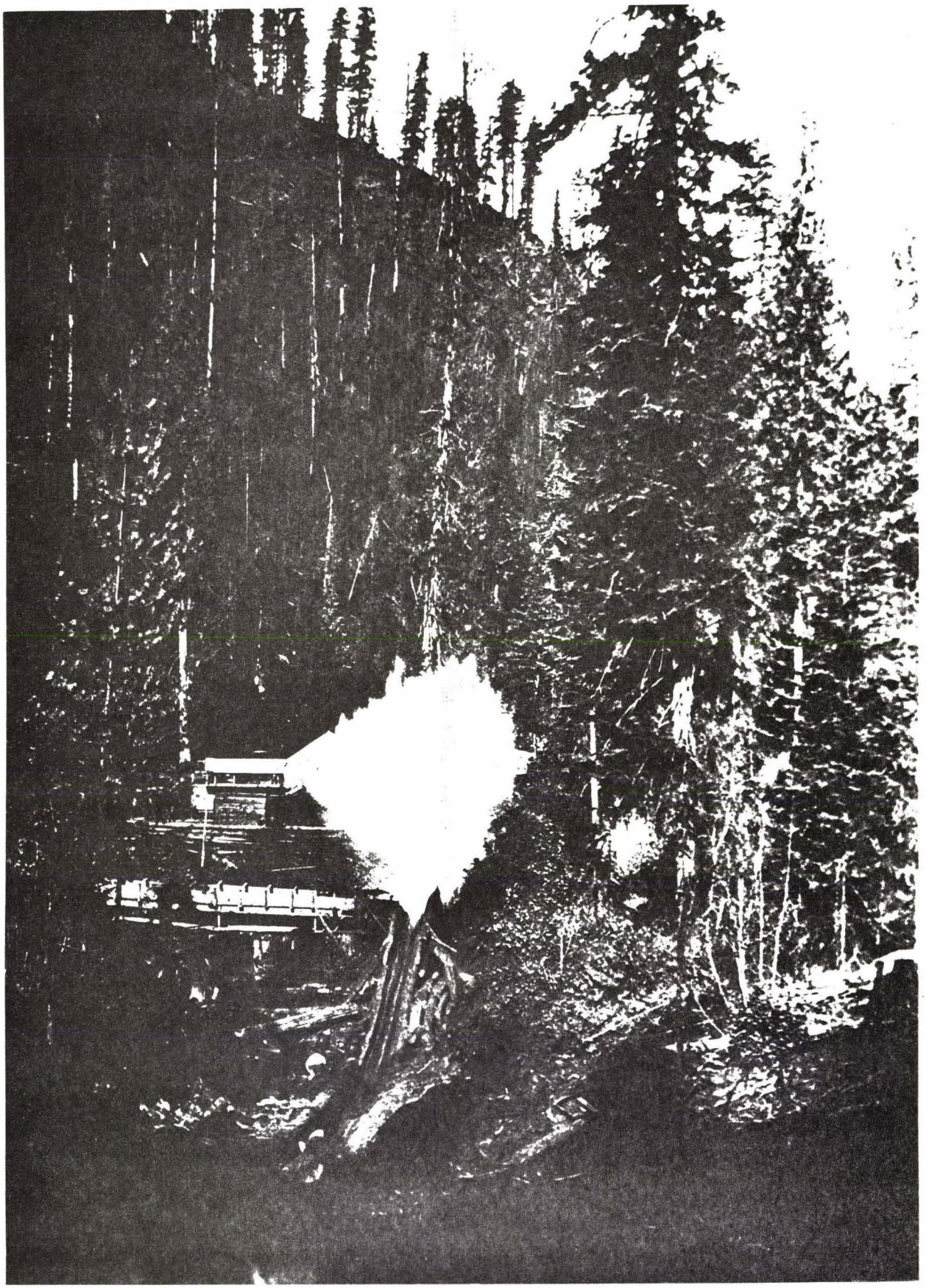


Figure 25, A water landing on a Rutledge Timber Company log chute, location and date unknown (Forest History Society).

Figure 26, A water landing at the end of a gravity chute on the St. Joe National Forest in 1914.

Figure 27, A water landing for a gravity chute on the St. Joe National Forest (date unknown).

Figure 28. A burned log chute resulting from a forest fire in 1925 (location unknown).

6. Log Chutes in Use

The construction and use of log chutes was influenced by a number of factors. One of the major factors included the associated transportation system.

> The chances on which chutes are used can be divided into the following classes in regard to transportation improvements: (1) chutes only, (2) chutes and flumes, (3) chutes and railroads, (4) chutes and trucks, and (5) chutes and sleigh or dray hauls. Obviously, the amount of chute necessary per acre or per thousand feet is affected by the major transportation system used. In this connection it was found that much more chute is used where chutes only, or chutes and flumes are the major means of transportation... (Neff 1927:39).

There were two types of hewn two-log chutes: running chute and trailing chute. On a running chute, the logs moved under the force of gravity. On a trailing chute, logs were moved with the aid of horses, tractors, or steam donkey engines. The gradient difference between running chutes and trailing chutes varies due to weather conditions, angle of the chute channel, the distance between the chute sticks, the species of tree used to construct the chute, and the size and species of logs being transported over the chute (Neff 1927:39). All of these factors influence the relationship between the coefficient of friction, slope angle, and weight. Table I shows the variation in the minimum grades needed for logs to run under the force of gravity. These figures vary from author to author but it appears that 25 percent is a reasonable grade for dry running chutes (c.f. Fisher 1896, Bryant 1913, Neff 1927). Maximum grades for log chutes range up from 80 to 100 percent (Brown 1934:212, Bryant 1913:237).

The operation of a running chute requires crews consisting of about 2 to 5 men. In some operations logs are decked along a chute on skidways during the summer, fall, or winter and run over the chute in the spring. In other operations logs are brought to the chute as they are cut and transported down the chute the same day. Normally a crew rolled

TABLE I

Minimum Grades Necessary for Running Chutes
(after Neff 1927:39)

	Hewed Flat	Hewed Steep
Summer, dry	20 to 25%	25 to 30%
Summer, wet	18 to 20%	20 to 30%
Summer, greased	15 to 20%	20 to 30%
Winter, wet	15 to 20%	18 to 25%
Winter, iced	7 to 12%	10 to 15%

> ...the logs into the chute with canthooks or peavies and let them go singly or several together down the chute. Other men are placed along the chute to regulate the speed of the logs and warn others below of their approach... The canthook men break the rollaways and roll the logs into the chute and with a choker, gooseneck or other means the first log is held and several more let down against it, thereby making up a trail consisting of 10 to 20 logs. When all is clear below the trail is released and, if necessary, started with the horse or team or by letting a good sized log down against it so that the logs travel together as a train. This is called "chuting in trails" and is the most effective way of chuting logs by gravity... (Neff 1927:157-8).

Trailing chutes needed some force other than gravity to propel the logs over them. Horses, tractors, and steam donkeys have been used to move the logs. When horses were used, the teamsters were assigned short sections of chute to pull logs over, called "beats" (Neff 1927:158). In order not to exhaust the horses, the beats were laid out so that the horses would have a rest on the trip back after a heavy pull. Tractors, on the other hand, could pull trails of logs the length of the chute if necessary.

Donkey engines were used with chutes by placing them in strategic locations along the chute. With rollers installed around curves to guide its cables (Figure 15), a steam donkey could trail logs up to a mile. Often a number of donkey engines were used along a long chute. The chutes built to be trailed with donkey engines are usually heavier and straighter than other log chutes. These chutes are sometimes called "donkey chutes" or "fore-and-aft" chutes.

> Donkey chutes may be constructed on nearly any necessary grade, with the exception that long minus grades of 28 percent or over are apt to lead to trouble, through the logs running and jumping the chute. The usual grade of downhill chutes varies from 3 or 4 percent to 20 or 25 percent. Adverse grades may occur in such chutes up to 10 or 15 percent. Usually an extra donkey is required at the top of any long or very steep adverse grade (Berry 1917:36-7).

To pull logs in a chute, chains or cables were attached to the last log in a trail. Two types of hooks were used to attach the chain or cable. The first type of hook was known as a "J" hook (Figure 31a). This is a hook in the shape of a "J" that is simply hooked on the end of the last log in a trail. To unhook the "J" hook, a teamster only needed to turn his team to the side. Another kind of hook consisted of tongs, much like ice carrying tongs (Figure 31b). These tongs grips harder as the amount of pulling force increases. Tongs are thus difficult to unhook with tension on the tow line. Both type of hook were often equipped with swivels to allow the tow line to keep itself from becoming twisted.

Many log chutes are a combination running and trailing chute. The logs might be trailed over level areas in the chute and allowed to run on the steep portions. Weather had a significant effect on the operation of log chutes. A dry trailing chute in the summer might become a running chute in the winter. A dry running chute may have become uncontrollable if it was wet. A good deal of effort was expended to increase or decrease the amount of friction between the log and the chute in response to weather conditions.

Logs are made to run faster or trail easier by greasing, wetting, or icing the chute (Figures 16 and 17). Grease included crude oil, tallow, or axle grease mixed with kerosene. A light oil was preferable in the winter and a heavy oil was preferred in the summer. Water was sometimes run down chutes that had been calked to make them water-tight. In the winter, snow was sometimes shoveled into chutes in front of each trail of logs. During cold weather, water was sometimes thrown on the chute to ice the channel.

To slow logs down, a variety of methods were used including putting sand on the chute and installing goosenecks, chain riprap, and bear traps. Figure 32 shows the location of a number of different devices in one chute. Depending on the terrain, time of year, weather conditions, and size of logs, the type and use of different log-slowing methods varied. Sand was heated and put on log chutes if ice and snow was allowing logs to attain too great a velocity (Strong and Webb 1970:115).

Logs ran over a chute were usually "sniped" before being loaded in the chute. This consisted of beveling the leading edge of the log (see Figure 12) so that it would not catch on any irregularities in the chute channel (Williams 1976:38).

Log chutes could last 10 years or longer if the trees in the area could support such a sustained harvest (Barton 1980:II,242). Maintenance of a chute consisted mostly of replacing portions of chutes that were worn out or torn away and skidding and re-chuting logs that jumped out of the chute.

Goosenecks

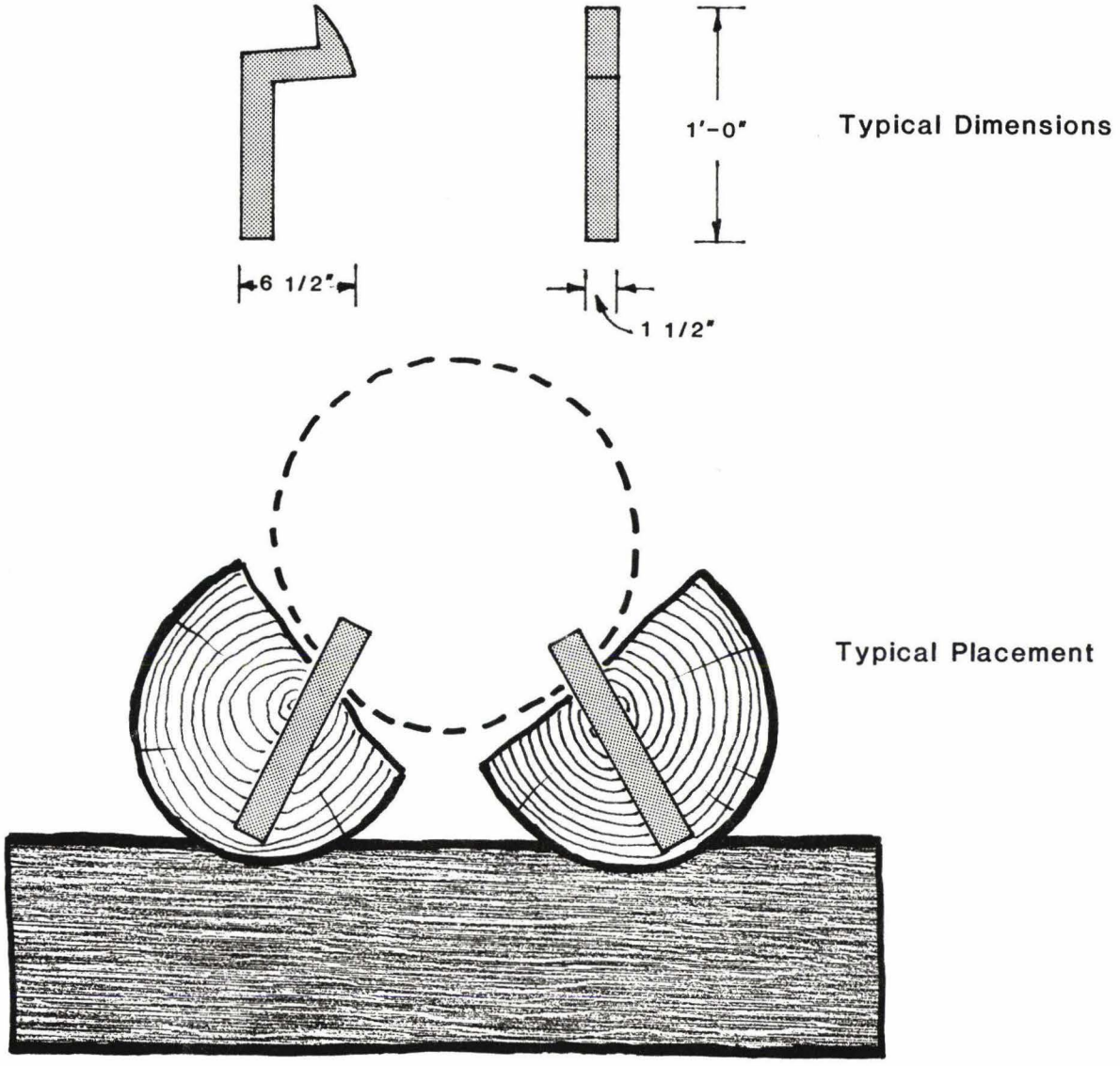
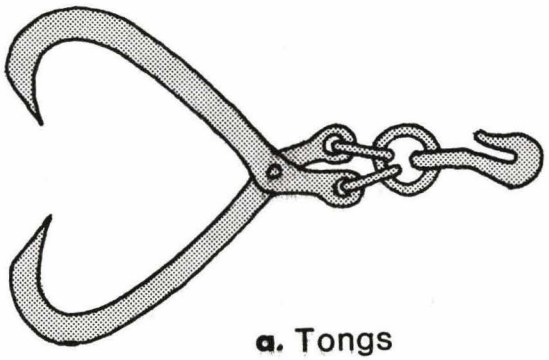
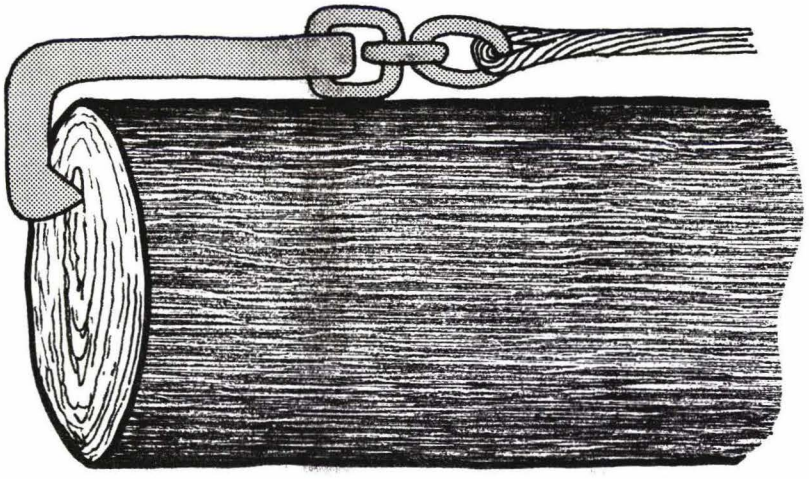


Figure 29

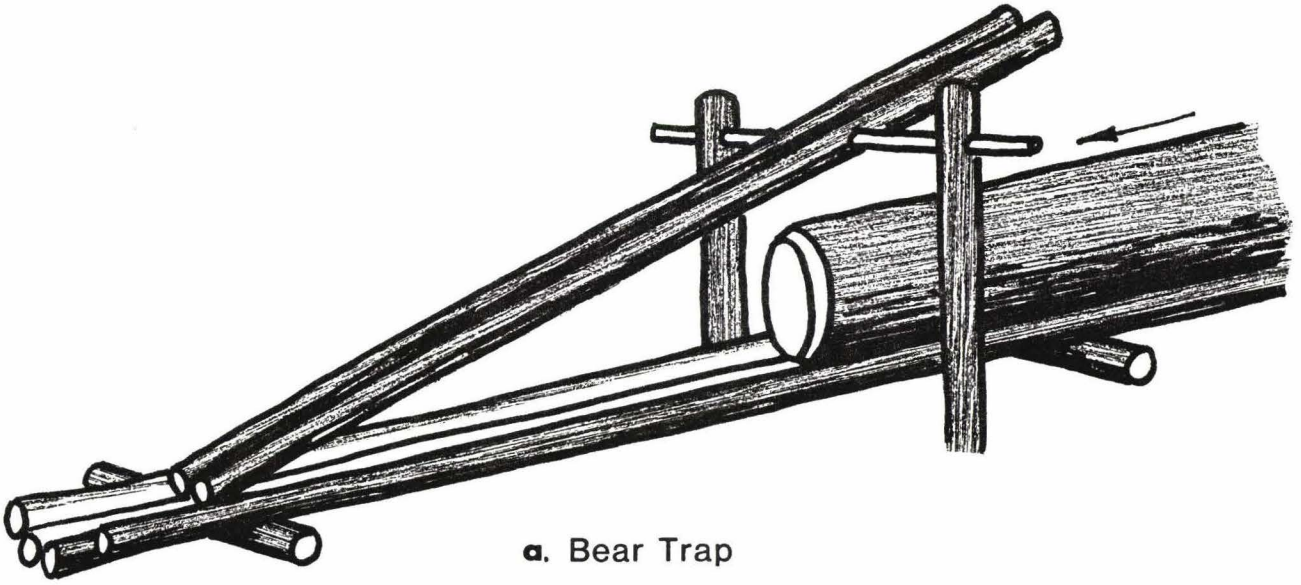


a. Tongs

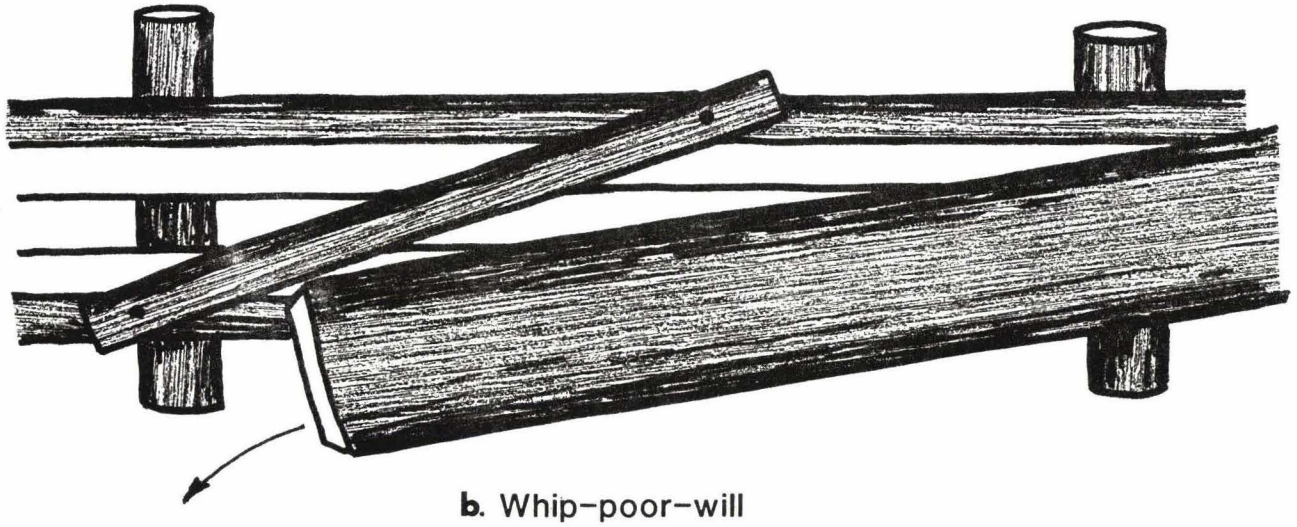


b. J hook

Figure 31



a. Bear Trap



b. Whip-poor-will

Figure 30

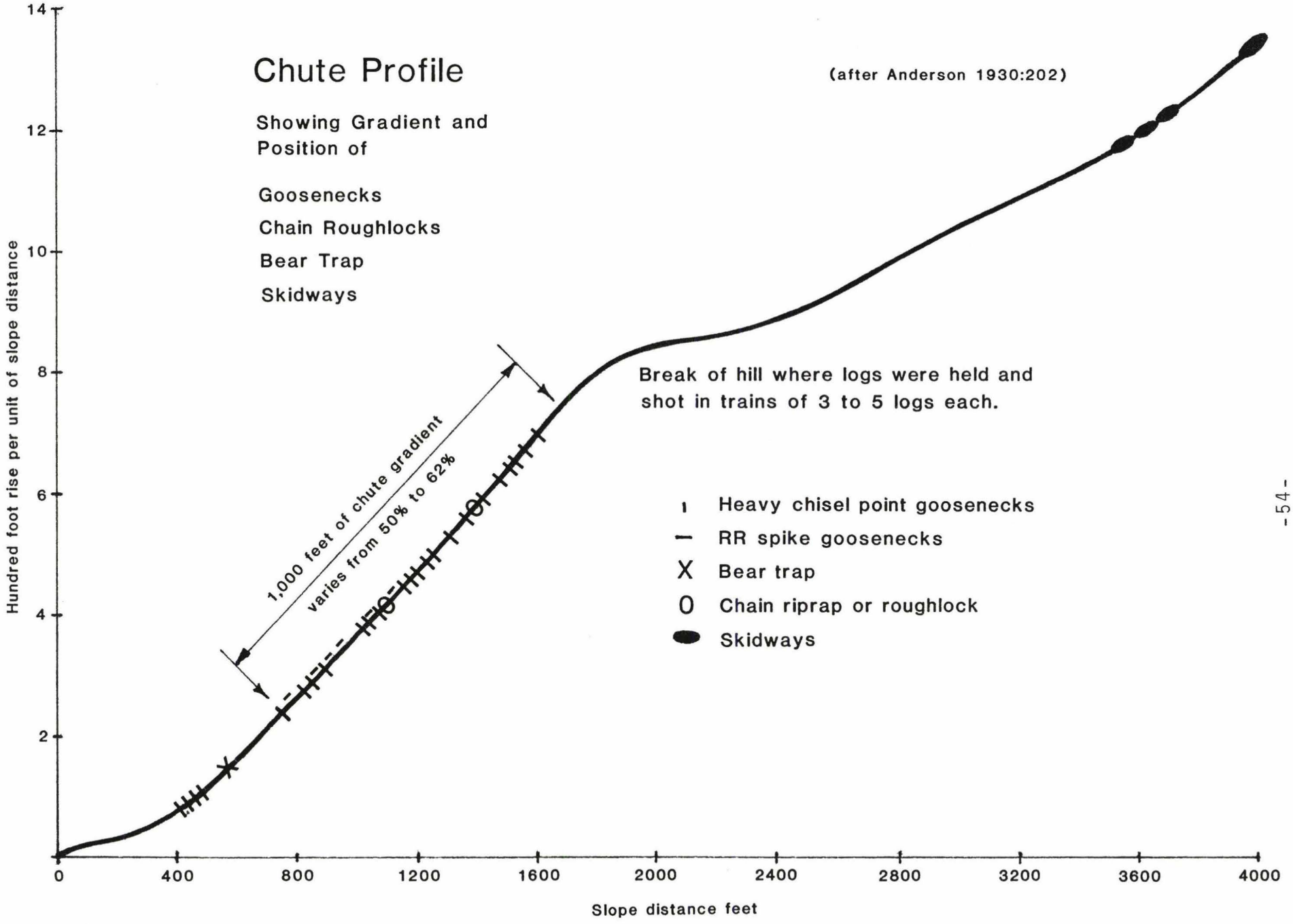

Chute Profile
(after Anderson 1930:202)
Showing Gradient and Position of
Goosenecks
Chain Roughlocks
Bear Trap
Skidways
Break of hill where logs were held and shot in trains of 3 to 5 logs each.
1,000 feet of chute gradient varies from 50% to 62%
Heavy chisel point goosenecks
RR spike goosenecks
Bear trap
Chain riprap or roughlock
Skidways
Hundred foot rise per unit of slope distance
14
12
10
8
6
4
2
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Slope distance feet

Figure 32

7. Problems and Accidents

It is not surprising, that when logs weighing a ton or more ran down a chute at high speed, problems and accidents occurred. In fact, working on a running chute was a dangerous occupation. Logs running at high speed often damaged themselves and other logs, while occasionally injuring people working along the chute.

In 1929, I. V. Anderson undertook a systematic analysis of log damage caused by running chutes (Anderson 1930). Anderson chose a typical running chute and placed a scaler at the head and at the terminus. Figure 32 is the profile of the chute used in the study. The resulting record of damage identified loss in value and volume. At the time, the Forest Service identified four types of damage: slab, broom, split, and break. Slabbing was caused by goosenecks, while the other types of damage were caused by collisions between logs in a chute. When average precautions were taken, Anderson found that loss of volume ranged between 4 to 6 percent (Anderson 1930:202).

Anderson noted that small logs (under 12 inches in diameter) sustained the greatest broom, split, and break damage. However, they did not show any slabbing damage. This happened because the goosenecks were set so that 12-inch logs could pass between them without being engaged. While this prevented the slabbing of small logs, it allowed them to run at high velocities. The higher speed of the small logs resulted in greater collision damage. If the goosenecks were set closer, the relative slabbing damage caused would have been greater for small logs than large logs because while the slabbing damage would be similar, the volume loss for small logs would be proportionately greater (Anderson 1930: 40). However, because of the weight of large logs make them run faster than small logs, the normal practice when making up trails of logs was to put the large logs behind small logs. As Neff (1927:158) observed:

> Light logs with rough bark such as cedar and red fir travel slower than heavier, smooth-bark logs and are more difficult to regulate, so such logs are placed ahead of pine or larch logs in

> the trail. Letting logs run one at a time is called "wild catting" them and is poor practice unless the chute is short with a good water landing at the bottom. Letting logs strike together is to be avoided, as it damages the ends.

Poorly built chutes or chutes negotiating an unavoidable terrain obstacle were prone to break under the stress of moving logs. Henry Janusch, a long-time Idaho resident, remembers

> They had one chute on Delaney Creek that's down from Honeysuckle--two miles, and that was really steep. And when it got down to Little North Fork River, they build a curve in it where the logs would come into the water. Every once in awhile a log would come down there and jump the curve, and they'd have to re-timber that curve about every two weeks (Barton 1980:II,33).

The damage to logs and to chutes as a result of running logs was fairly common. Injury to animals and people also occurred with tragic regularity. Strong and Webb (1970:113) mention a cow that was "killed and scattered along" a chute on the shore of Lake Coeur d'Alene in the early 1900's. At times, the tallow used to grease some chutes attracted wild animals such as bears (Ward Smith, personal communication, 1982). In these instances it was the loggers that probably got the scares.

A quite gruesome tale was related by Henry Janusch:

> And then one time, on this Delaney chute. The fellow he didn't, he didn't use this hook J hook . He used a pair of tongs and he started down. He had a log that's cleared about 300 feet. And, he took it all the way down to where the chute broke and then he couldn't get unhooked, and that big log dragged that team of horses about a half a mile down that steep hill, and there were these big rocks, and rocks, and whatever that was on the bottom there. And one horse didn't have any hide left, and the other one had its neck broke. And, he lost a good team (Barton 1980:II,33).

There are numerous stories of people being injured while working near or on log chutes. One of the most unusual accidents occurred in 1895 when,

> ...as a feature of the Fourth-of-July celebration, Captain Paul Webb made a perilous ride down a mountain log chute. Webb was a professional daredevil who had navigated various falls in a specially constructed barrel, eight feet long and three feet in diameter, equipped with springs and cushions to relieve concussion. In this barrel he rode down the Rosen log chute, a steep wood trough eleven hundred feet in length, which had been built for shooting logs down a steep hillside into the lake.
>
> At four o'clock the boats steamed from the Northern Pacific dock eight miles up the lake, with five hundred people on board to witness the spectacle. It was a rainy day and the chute was wet and slippery. To test it, a log was sent down. The log shot down swiftly and plunged into the lake.
>
> Webb told his manager to have the whistles blown when he hit the water. Then he climbed inside the barrel and started down. The barrel went down with a roar, gathering speed as it dropped. Two-thirds of the way down was a slight incline; here the barrel jumped thirty feet in the air, left the chute, and rolled down the hillside. People on the boats turned their heads in horror; women fainted.
>
> When the barrel was opened, Webb was found crushed and unconscious. He was placed on the Belleville a lake steamboat and rushed to town. He died in a hospital two months later (Hult 1952:62-3).

Most accidents involved logs leaving a chute and hitting people in the vicinity. I. V. Anderson recalls a logging superintendent that was inspecting his company's operations in the 1920's. It was common practice to get up to the head of chutes by walking up them with caulk boots. The logging crew did not realize the superintendent was coming up the chute and sent a trail of logs

down. Taken by surprise, the logging superintendent was struck by the logs and killed (I. V. Anderson, personal communication, 1982).

Where log chutes crossed public roads or other areas where people could be injured by running logs, a flagman was stationed at the lower end of the chute to warn people of the danger. Oscar Blake (1971:1-3) was a flagman in Oregon in the early 1900's. He states:

> The log-chute in question was "live"--that is, the logs came down the chute at the rate of about a mile of minute in some places. The chute crossed the county road, a wagon road, with a bridge built over the top. It was my job to blow a horn while the logs were coming down... The distance from the chute crossing to the dam where the logs landed, in about forty feet of water, was about five hundred feet, and on top of the hill where logs were started over, was approximately one-quarter mile. I had a wire with a large flag rigged on it, that could raise or lower, and when the flag was lowered, the teamsters...were not to send over any loads.

Blake recalls one day when a teamster sent logs over when the flag was down. Blake was pushing logs away from the end of the chute when the trail of logs came down the chute and hit the holding pond. He was thrown into the water and nearly drowned.

Blake (1971:72) also recalled an incident in which a man working on the end of a chute next to a creek in north Idaho was killed. This time, however, it wasn't the logs in the chute that caused the death. The chute ended in a creek periodically flooded by opening a series of dams to wash logs downstream. A flood apparently caught the chute worker by surprise and he was killed.

Strong and Webb (1970:112-3) point out the hazardous nature of log chutes.

> Working around active chutes was dangerous. Some lumberjacks lost their lives and others were severely injured on chuting opera-

tions. Herbert Carlson, former logger and now an assistant on the Coeur d'Alene District of the Coeur d'Alene National Forest, reports that several men were killed by runaway logs along the Delaney Creek chute on the Little North Fork of the Coeur d'Alene; in one month two workmen were killed along the chute and he helped carry out the bodies. On another occasion a logging foreman was killed at a chute landing on Winton Lumber Company operations on Emerald Creek, south of Fernwood.

Ward Smith, a logger in north Idaho since about 1914, tells of a time when he was trailing logs in a flat area in the middle of a running chute. The small logs would stop in the flat area but the large logs would have enough momentum to carry them all the way down the chute. On one occasion when he was clearing the chute of small logs, a trail of heavy logs came thundering down the chute. He managed to get the team unhooked and out of the way just as the large logs struck the logs he was trailing. Logs cartwheeled all around him and the team, but they somehow escaped injury (Ward Smith, personal communication, 1982).

Fires not only destroyed valuable timber but also destroyed the means to quickly transport the fire killed wood out of the forests. As Figure 28 shows, fires destroyed many chutes. There is even some who claim that the friction of logs going down a gravity chute sometimes started fires (Strong and Webb 1970:113). While this has not actually been verified, the 1923 Marble Creek Fire just south of the St. Joe River is known to have been caused by a chute greaser melting grease on a fire (Greeley 1936:7).

Not all of the problems encountered along log chutes were life threatening. Roy Brickle remembered a chute builder with a large diamond ring. The ring was lost along one of the chutes being constructed and was never found (Russell 1979: 116).

8. Log Chutes as a Cultural Resource

Log chutes were located throughout north Idaho and were used from the late 1800's to the late 1930's. The remains of these log chutes are commonly recorded by Forest Service archeologists on the Idaho Panhandle National Forests.

These chutes are recorded as "cultural resources". That is, they are recognized as evidence of past human behavior. It is possible that this evidence can cast light on past events and people. Individual log chutes embody distinctive characteristics in construction, period of use, and as a type of transportation. It is conceivable that log chutes will yield important historical information when archeologists are able to ask the right questions and record the pertinent information. Based on the discussion in the previous parts of this paper, it is possible to formulate a series of historical questions which the study of log chutes may help answer.

An examination of the remains of log chutes today should reveal an understanding of log chute construction. Through a comparison of various construction attributes of log chutes it should be possible to identify elements of style. This nebulous concept boils down to ways of making the same things in different forms. Styles fluctuate in popularity over time. This makes it possible to date some things made by man based solely on their stylistic characteristics. It also allows tracing the groups of people who used identifiable styles of material culture. In addition, the study of log chutes should yield some information about the way the chutes were used and the approximate age of these structures.

A. Construction

An examination of the construction of log chutes should begin with the types of materials used. Log chutes were composed mainly of locally available trees and chute spikes. The identification of the type of tree used in chute construction can provide information on the cost of the chute. Rotten logs are identifiable, but correct identification takes some practice.

The structure of various coniferous trees have unique features which are observable in the rotten logs of log chute remains. Figure 33 shows the three planes on which characteristic features of tree types are observable. The following features of each type of tree likely to have been used in north Idaho are based on the work of Minore (1966) and Brown, Panshin, and Forsaith (1949).

Douglas-fir

(1) Distinct bands of summerwood sharply defined on both edges.

(2) On the tangential surface are occasional lens-shaped spots observable with a hand lens.

(3) Summerwood moderately wide to very wide dark bands.

Western Red Cedar

(1) Strong cedar odor.

(2) Summerwood sharply defined only on one edge, blending into the springwood on the inner edge.

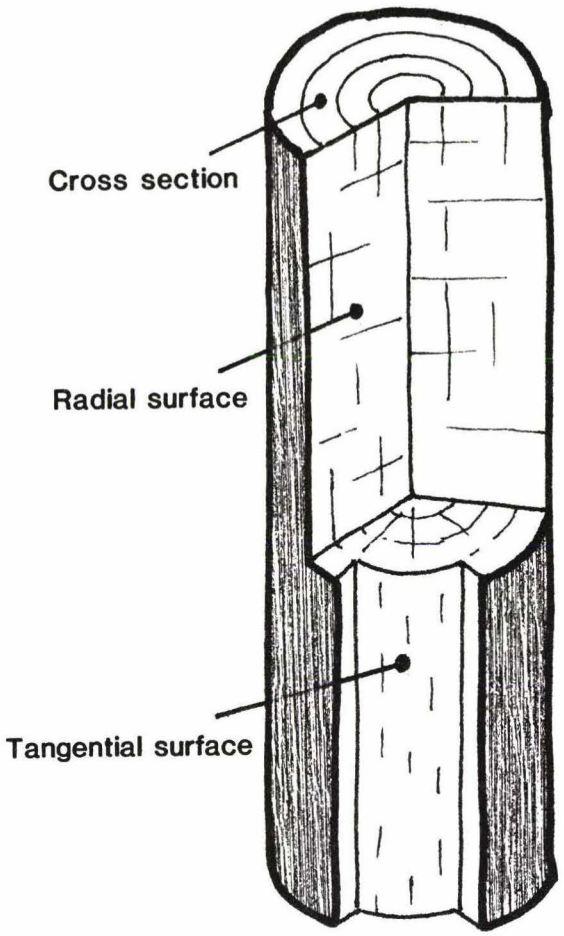
(3) Fine, short linelike flecks on the tangential surface observable with a hand lens.

Western Hemlock

(1) Strongly resembles the true firs.

(2) Summerwood sharply defined only on one edge, blending into the springwood on the outer edge.

(3) Relatively wide annual rings with broad bands of summerwood.



(after Minore 1966.3)

Figure 33, Surface terminology for wood identification.

(4) Clearly visible, dense, and opaque linelike flecks on the tangential surface observable with a hand lens.

True Firs

(1) Closely resembles western hemlock, however with very thin shavings and a hand lens, it is possible to distinguish true firs from western hemlock.

(2) Summerwood bands on the radial surface is sharply defined only on one edge, blending gradually into the springwood on the inner edge.

(3) Relatively wide annual rings with relatively narrow bands of summerwood.

(4) Fine, linelike flecks are barely visible on the tangential surface with a hand lens on thin shavings. These flecks are less dense and lighter in color than those in hemlock.

Western White Pine

(1) Distinct growth rings on edge, summerwood sharply defined on outer edge and blending gradually into springwood on the inner edge.

(2) Wood with a resinous odor.

(3) Large resin canals appearing to the naked eye on the cross section.

(4) The springwood on the tangential surface has large boardered round pits in it.

Western Larch

(1) Strongly resembles Douglas-fir.

(2) Distinct bands of summerwood sharply defined on both edges.

(3) Summerwood zones dark and very narrow.

(4) Lens-shaped spots observable with a hand lens on the tangential surface.

Engelmann Spruce

(1) Summerwood and springwood distinctly delineated but outer edge grades into springwood.

(2) Resin canals occur individually or sometimes in a line. Visible with a hand lens on the tangential surface.

It is probably best to lump several of the similar tree types together rather than make guesses. This would produce the groups (1) western larch/Douglas-fir, (2) western hemlock/true fir, (3) pine, (4) spurce and (5) western redcedar. The best decay resistant species are in this order: cedar, spruce, larch, Douglas-fir, pine, fir and hemlock. The species most likely used in log chutes, because of decay resistance and low market value, were western larch and Douglas-fir.

A record of log chute construction features should include:

(1) Type of chute
    hewn two-pole chute
    three-pole chute
    ground chute
    roller chute

saw-timber chute
other

(2) Location
creek bottom
hillside
other

(3) Size and dimensions
total length
number of branches
spacing of cross ties
length of chute sticks
length of cross ties
distance between chute sticks
chute channel side angles
other

(4) General characteristics
slope
elevation
construction materials
other

(5) Specific features including location, number, size, and appearance of
skidways
log decks
log crib supports
rollaways
tow paths
braces
banked curves
other

B. Use

Information about the use of log chutes can be obtained by examining selected features of log chute remains. Using the information in Table I it can be determined under what conditions a log would run in a given chute. Using the formulas discussed in Section 3 of this report, it is possible to determine the acceleration and momentum of a given size log.

Log chutes were often a combination of running and trailing chutes. A profile of a chute under study, such as the one illustrated in Figure 32, can help identify potential trailing and running areas in the same chute. With this profile, fieldwork might be directed at areas suspected of containing features to regulate the speed of logs (such as goosenecks, chain riprap, and bear traps). The fieldwork can thus be focused, after the description of construction characteristics, on features which will yield information on the use of the log chute.

Knight (1981:41, 53) suggests that discarded metal containers along a chute would indicate that it had been greased. This argument is weak in Knight's case because he attempts to turn the argument around and claim that the absence of metal containers means a chute was not greased. Such negative evidence is seldom tolerated by modern archeologists. A better method of showing the extent a particular chute was greased is to apply a chemical test to the wood in the chute channel. The samples would ideally be taken in a systematic fashion and control samples would be taken from the bottom or outside of the chute sticks. By comparing channel samples with control samples the investigator should be able to identify lubricating grease. A systematic sampling of the chute (e.g., at measured intervals) would produce a clear picture of chute greasing. Several chemical compounds have been experimented with for identifying lubricants without any degree of success. However, this is still the most promising avenue of investigation.

The use of a chemical test would never be so accurate that it could be absolutely relied upon to identify chutes that were not greased. Very old or

weathered chutes may no longer contain the grease that was once applied to it. A good rule is to avoid all together the use of negative evidence in this and all similar situations.

C. Age

Knight (1981:33) has suggested a way to provide a minimum age for log chutes with the use of an increment borer. In many cases trees have grown up through or by log chutes after their abandonment. The best procedure is to bore a number of trees. If the trees are bored at breast height, then 5 to 7 years should be added to the date. Trees might have been hindered from immediately reclaiming the chute right-of-way for a number of reasons. It, therefore, must be stressed that the increment borer date is a minimum date only.

Another way of using tree rings to date log chutes is through the use of dendrochronology. The definition of dendrochronology is "the study of the chronological sequence of annual growth rings in trees" (Ferguson 1970:183). Rather than simply count rings, dendrochronology identifies a chronological sequence of growth associated with variations in climate. Where trees are sensitive to changes in some climatic factor, a pattern can be identified of narrow and wide rings (Ferguson 1970:189). Once established a chronology can be used to date dead trees such as those used to construct log chutes. Rather than a minimum date provided by ring counting, dendrochronology under the right conditions can provide exact year dates.

It is interesting at this point to note that western larch and Douglas-fir are fairly sensitive to various climatic factors and are among the easiest trees to construct a chronology. Since these are the trees most often used in constructing log chutes it may be a fruitful avenue of future research.

Other means of dating log chutes would include the analysis of associated datable artifacts such as cans and bottles. Dates might also be obtainable from written records and old newspapers, early aerial photographs, and from the accounts of living persons who have personal knowledge of the construction and use of log chutes.

9. Log Chutes in the Marble Creek Drainage: Some Examples

The Marble Creek drainage is located about 15 miles southeast of St. Maries, Idaho, in the southern part of Shoshone County. It is a major tributary of the St. Joe River which it joins halfway between Calder, Idaho, and Avery, Idaho. The approximately 80,000-acre Marble Creek drainage is about 6,000 feet above sea level at its headwaters and descends to 2,760 feet above sea level at its confluence with the St. Joe River. The drainage is typified by steep valleys which have always made access to the area very difficult.

The great 1910 fire of northern Idaho missed the Marble Creek drainage with its abundant stands of mature white pine. Logging operations began in the drainage soon after 1910 and reached their peak in the 1920's following a large fire in 1922. After 1932 the Marble Creek drainage was largely abandoned by the logging companies. During the period of logging activity nearly every known method of log transportation was attempted to some degree. Hand logging, horse logging, sleds, log chutes, flumes, splash dams, and railroads were used in Marble Creek in attempts to get the logs out. By far the greatest volumes of wood was transported in drives down Marble Creek on man-made floods. In all the years between 1910 and 1932 the logging operations in Marble Creek were at best only marginally profitable (Strong and Webb 1970:63, 67).

Log chutes were used in the Marble Creek drainage with every other type of transportation. Both gravity and trailing chute was used extensively during the period following 1910 to the early 1930's. Today the Marble Creek drainage is considered eligible to the National Register of Historic Places because of its extensive remnants of early 1900's logging technology. The drainage is in the process of being inventoried for cultural resources so that it can be formally nominated to the National Register.

The findings of the inventory so far shows that log chutes were used in every conceivable part of the drainage. All of the log chutes date from the 1910's or 1920's. The present condition of the chutes varies with the local microclimate, but many have survived in relatively good condition. All of the chutes are

basically two pole hewn chutes with variations in dimensions, supports, tow paths, and other features based on the builder's preferences and the topography. Three examples have been chosen to illustrate the variety of log chutes in the Marble Creek drainage.

The first example is a log chute in a draw in the Daveggio Creek valley. The chute is 4,000 feet long and rises in elevation 1,060 feet (Figure 36). The chute has decayed significantly in some areas and in a few places remains fairly sound. It appears to have been constructed of larch/Douglas-fir type wood. The chute is a hewn two-pole type with 20 foot chute sticks and 4 foot cross ties every 10 feet. There is a 4-inch gap between the parallel chute sticks. It is located in the bottom of a draw which extends down to Daveggio Creek. The chute sticks are about 14 inches in diameter an have 13 inch wide hewn faces on a 15 degree angle. Twelve inch long, 3/4 inch square chute spikes (Figure 40a) were used to fix the chute sticks to the cross ties. The spikes were pounded through notches in the outside edges of the chute sticks. The end of the chute has been destroyed by decay and erosion but apparently ended in a water landing created by a dam on Daveggio Creek. No loading platforms were found on the chute.

The chute is supported over a number of low areas on crib framework supports, one or two logs high. A log covered tow path (corduroy road) or earth tow path about 8 feet wide parallels the chute on the upper end. On this portion of the chute the slope is about 10 degrees. On the lower portion of the chute the gradient increases to 23 degrees or more and no tow path is associated with this portion of the chute. However, fender poles were spiked on top of the chute sticks to make the chute deeper. The lower part of the chute makes a gentle curve without being banked.

A large number of the chute spikes are missing from the upper end of the chute and were probably salvaged when the chute was abandoned. About 60 square 5-gallon cans were found in a pile on the upper end of the chute. The only markings on the cans consisted of the words "made in U.S.A. by the Texas Company". These cans are thought to have contained a light to moderate weight oil

used as a lubricant on the tow chute. Another pile of galvenized buckets was located at the head of the chute. Many of these buckets had "Standard Oil Co." and "Mica Axle Grease" printed on them (Figure 41). Others had the Shell Oil Company shell symbol pressed into the metal.

The second example of a log chute in the Marble Creek drainage was found in the Cornwall Creek valley. This chute is located in a steep draw running into Cornwall Creek. It is in fairly good condition in some places and completely destroyed in others. This chute is 2,400 feet long and drops 1,100 feet from the top to the bottom (Figure 36). It was largely constructed of the larch/ Douglas-fir type wood.

This chute, like the first example, is a two pole hewn chute. However, it has 28 foot long chute sticks that are 17 inches in diameter. Four foot long cross ties were placed every 14 feet under the chute sticks. Twelve inch long and 3/4 inch square chute spikes appear to have been used exclusively to assemble the parts of the chute. The parallel chute sticks are approximately 4 inches apart, with 12 inch hewn faces and hewn at about a 15^{o} angle. No loading platforms or landings were observed.

The Cornwall Creek log chute was a gravity run chute. The gradient of this chute is about 27 to 30 degrees (or about 50 to 60 percent). Logs would obviously attain a high speed in this chute if not slowed down by some method. Goosenecks were apparently used on the chute as one means to slow the logs down. One of these goosenecks was found just down stream from the log chute in a logging camp (Figure 40b). Fender poles were attached to one or both sides of the chute at various locations. At one location, short vertical posts were used to brace one side of the chute through a low area. These posts were simply spiked into rough notches in the side of the chute sticks.

Only one chute has so far been located in Cornwall Creek. On the other hand, a large steam donkey and a splash dam have been located in the valley. The very steep topography of the area is apparently the reason for the lack of log chutes. An early logger in the Marble Creek drainage, Wash Applegate, remembered that one logging company

> ...had a highline donkey up Cornwall. We'd skid the logs with teams maybe a quarter of a mile. The stumps had been cut off so then we could let them roll down into the side canyons and main canyon into big decks. They'd put a highline from the donkey over these decks and pull the logs where they could be flooded down (Russell 1979:19).

The third and final example of the kind of log chutes in the Marble Creek drainage is a chute in the Hobo Creek valley. This chute is 9,300 feet long and rises 800 feet from its bottom end to its highest branch. This chute is located along the main Hobo Creek valley with branches up some side draws. The chute is in various states of decay, but there are some well preserved sections of the chute. Western larch and Douglas-fir were the main trees used in the construction of this chute. The chute sticks are about 20 feet long and 18 to 20 inches in diameter. About four foot long cross ties were used in some places every 10 feet. The gap between the parallel chute sticks varies greatly from 4 to 10 inches. The hewn faces are about 12 inches wide and are on a 15 degree angle.

The chute has a gradual slope of about 5 to 10 degrees. On the upper end of this chute construction varies from a two to a three or to a four pole chute. The extra one or two poles are small in diameter and are located between the hewn chute sticks. This forms a trough that is about 2 and ½ feet wide. In other areas the chute sticks are boardered by large fender poles on each side of the chute. A dirt tow path appears to have been constructed along most of the chute. Log loading platforms consisting of a deck of logs parallel to the chute were noted in several areas.

The Hobo Creek log chute was a tow chute and steam donkey engines were used as the primary power to move logs in the chute. One of these donkey engines still stands at the end of the chute just above a logging dam on Hobo Creek. Another stood along the chute for years until it was moved to a park in St. Maries, Idaho. A fairly good description of this chute appears in Bert Russell's Swiftwater People where Pete Johnson is quoted as saying:

> In the spring of 1928 we moved a donkey 2 miles from Camp 20 on Cranberry Creek in six feet of snow into Hobo Creek....we set up the donkey for trailing logs on the Hobo chute. Stonebreaker was packer at that time and he brought in exactly 5,000 feet of 1-inch cable from Clarky on a string of the biggest pack mules he could find...On our donkey line we had what you call tags and each would haul about 5 logs and push 3 logs ahead of it down the chute. We'd move a total of maybe 30 logs. Since the chute curved down the canyon we used side rollers along the chute to hold the line in and braces holding the rollers.... Then when we got the logs as far as the first donkey could move them, we'd hook them onto the donkey below and take them the rest of the way (1979:304).

Associated with the chute are long segments of steam donkey cable. All of the rollers along the chute have been salvaged along with many other metal artifacts such as chute spikes.

All three examples show some similarities in construction and materials. All three were constructed with western larch or Douglas-fir. Twelve inch long, 3/4 inch square chute spikes were primarily used in putting the chutes together. The major difference between the chutes results from differences in topography which determined if the logs in the chute would run under the force of gravity or have to be towed. The profiles clearly show the differences between tow chutes and gravity chutes (Figure 36). Associated artifacts such as grease buckets, cable, and goosenecks support the conclusions drawn from the profiles.

Other differnces may be realted to the personal style of the chute builder, to expediency, or to some other reasons. The use of steam donkeys on the Hobo Creek chute, for example, was adopted for reasons of economy. However, they did not necessarily attain the economy for which they were intended. Pete Johnson stated that

> The whole business was a foolish boondoggle, like using a giant to handle toothpicks. The logs could have been moved faster and cheaper by teams of horses (Russell 1979:305).

In other cases log chutes were built to avoid land owned by rival logging companies. The donkey chute in Cranberry Creek (from which Pete Johnson moved a steam donkey in 1928 to Hobo Creek) was built from the upper end of Cranberry Creek, along a contour and over the divide into Bussel Creek. This circuitous route was chosen because the lower Cranberry Creek drainge was owned by a bitter competitor of the owner of the upper Cranberry Creek drainge.

The vertical support posts noted on the Cornwall Creek chute appear to be an example of an individual builder's style. Further work in the Marble Creek drainage may allow a better definition of such elements of style. This will be greatly facilitiated by the accurate dating of these features. The use of two different weights of petroleum on the Daveggio Creek chute may indicate use over several seasons (e.g., spring and summer). A more detailed examination of artifacts assocated with log chutes has the potential of providing unique information on the use of the structures.

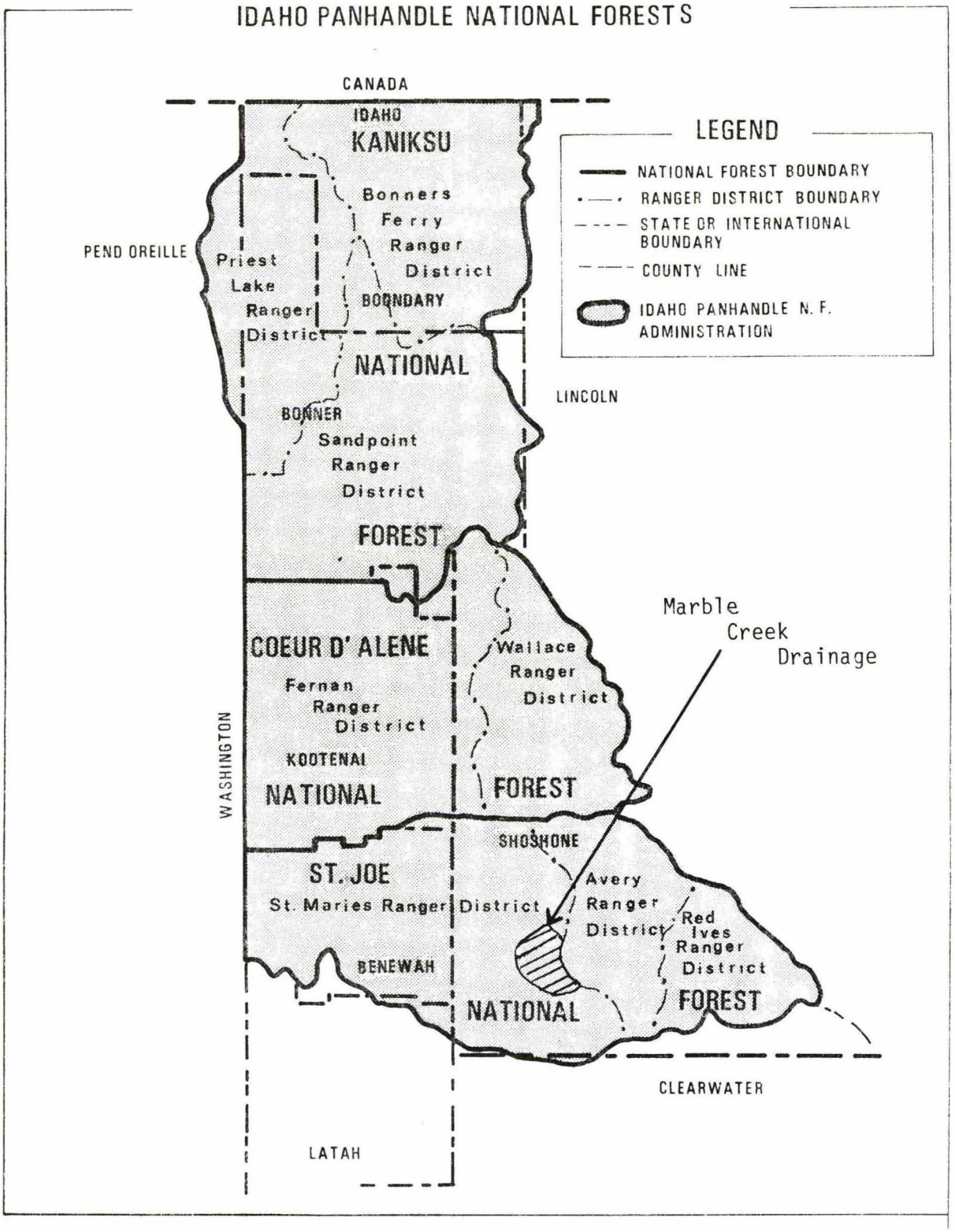


Figure 34, Idaho Panhandle National Forest Map showing the general location of Marble Creek.

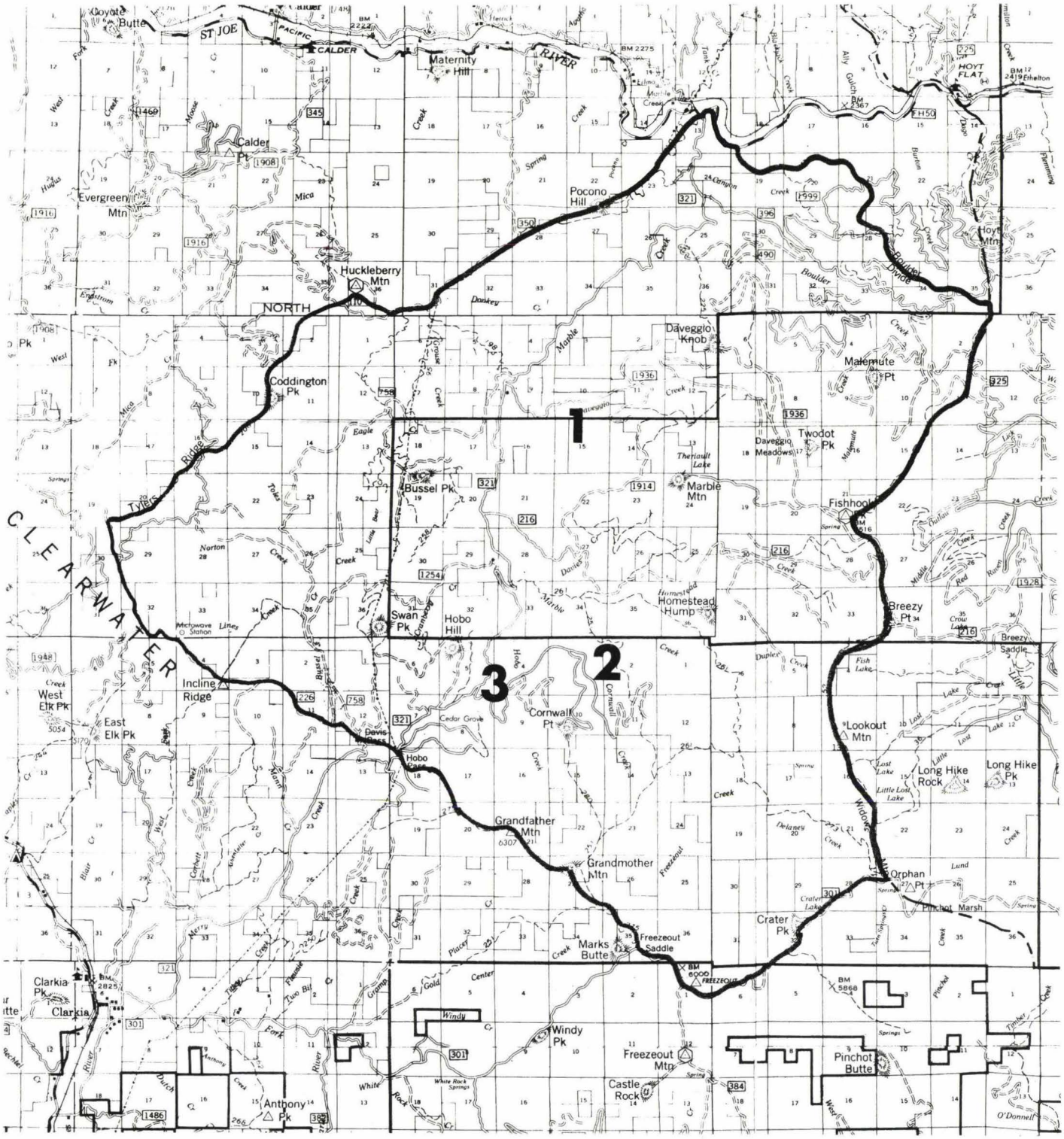


Figure 35, Map of Marble Creek drainage showing (1) location of Daveggio Creek log chute, (2) location of Cornwall Creek log chute, and (3) location of Hobo Creek log chute.

Three Log Chute Profiles in the Marble Creek Drainage

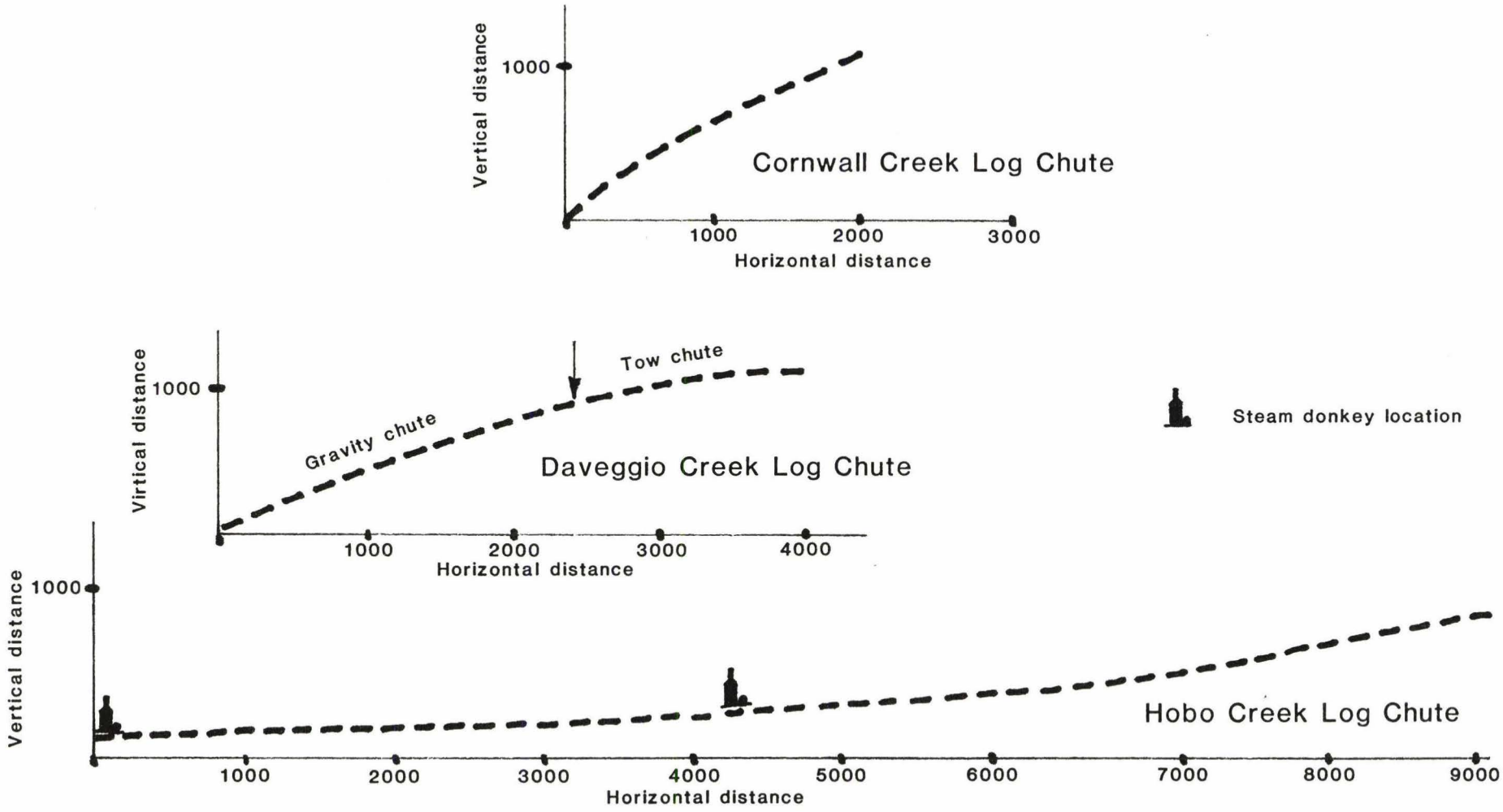


Figure 36

Figure 37, A view of the Daveggio Creek chute.

Figure 38, A view of the Cornwall Creek chute.

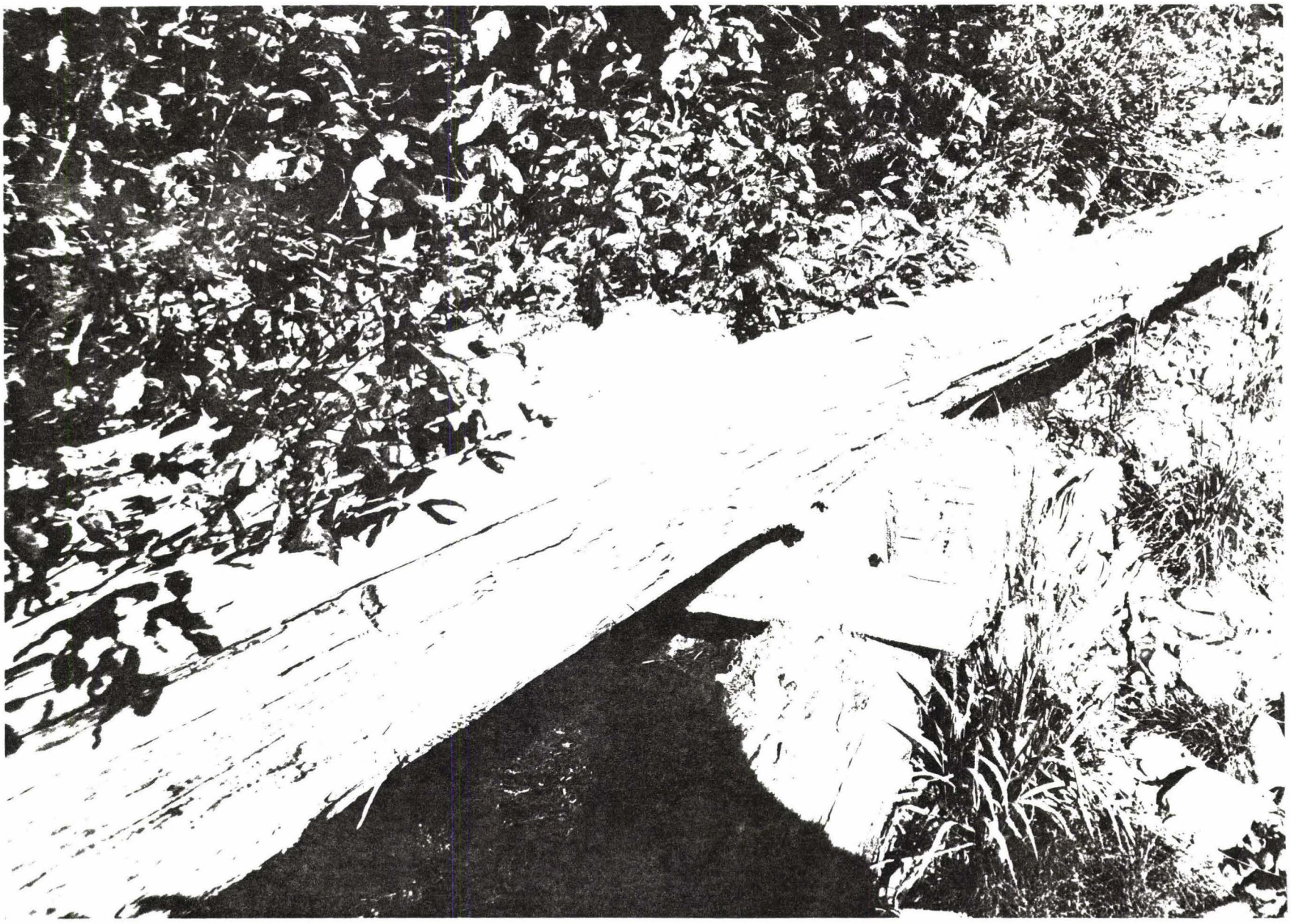


Figure 39, A view of the Hobo Creek chute.

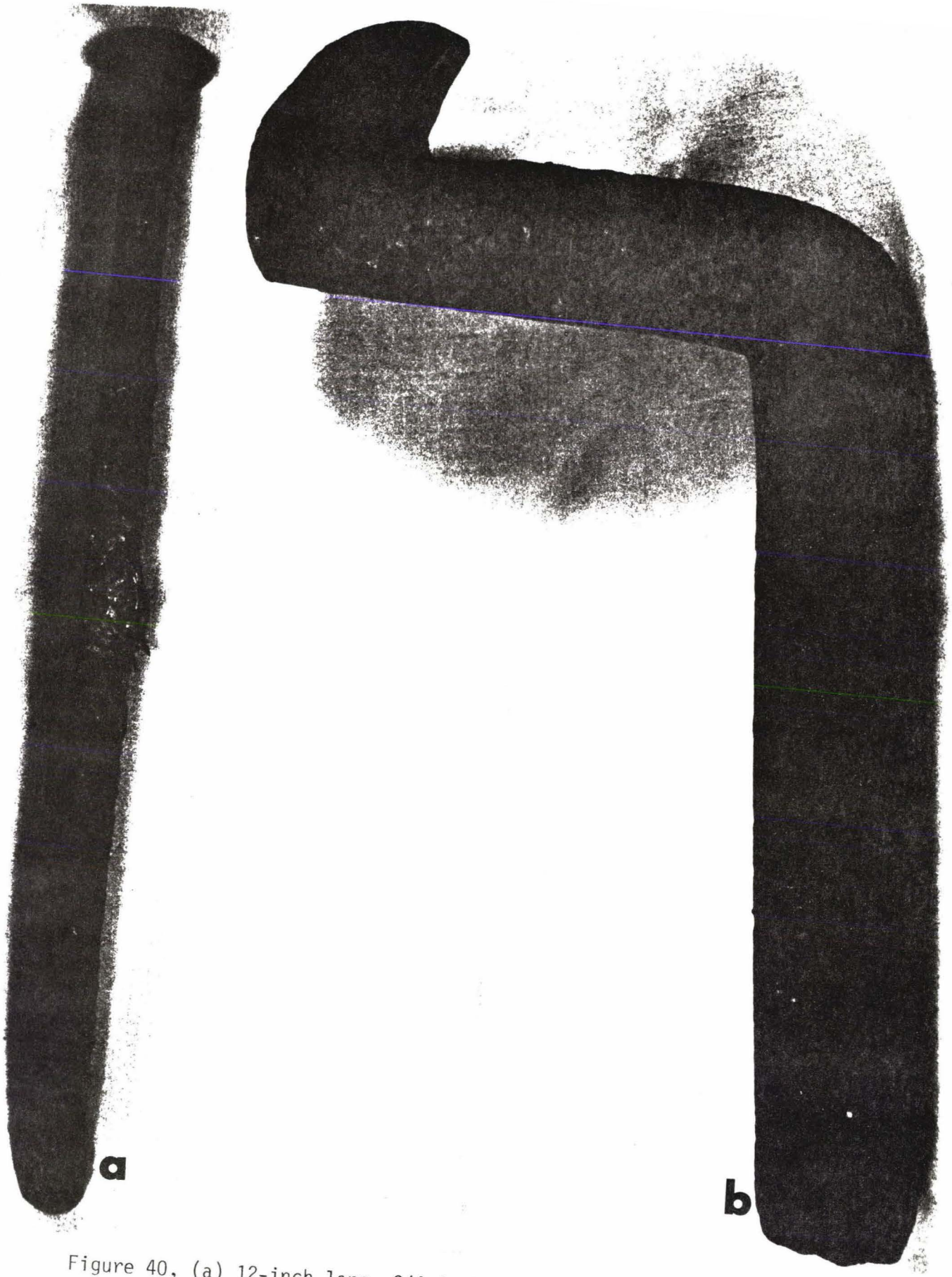


Figure 40, (a) 12-inch long, 3/4-inch square chute spike from the Daveggio Creek chute.
(b) a gooseneck from Cornwall Creek.

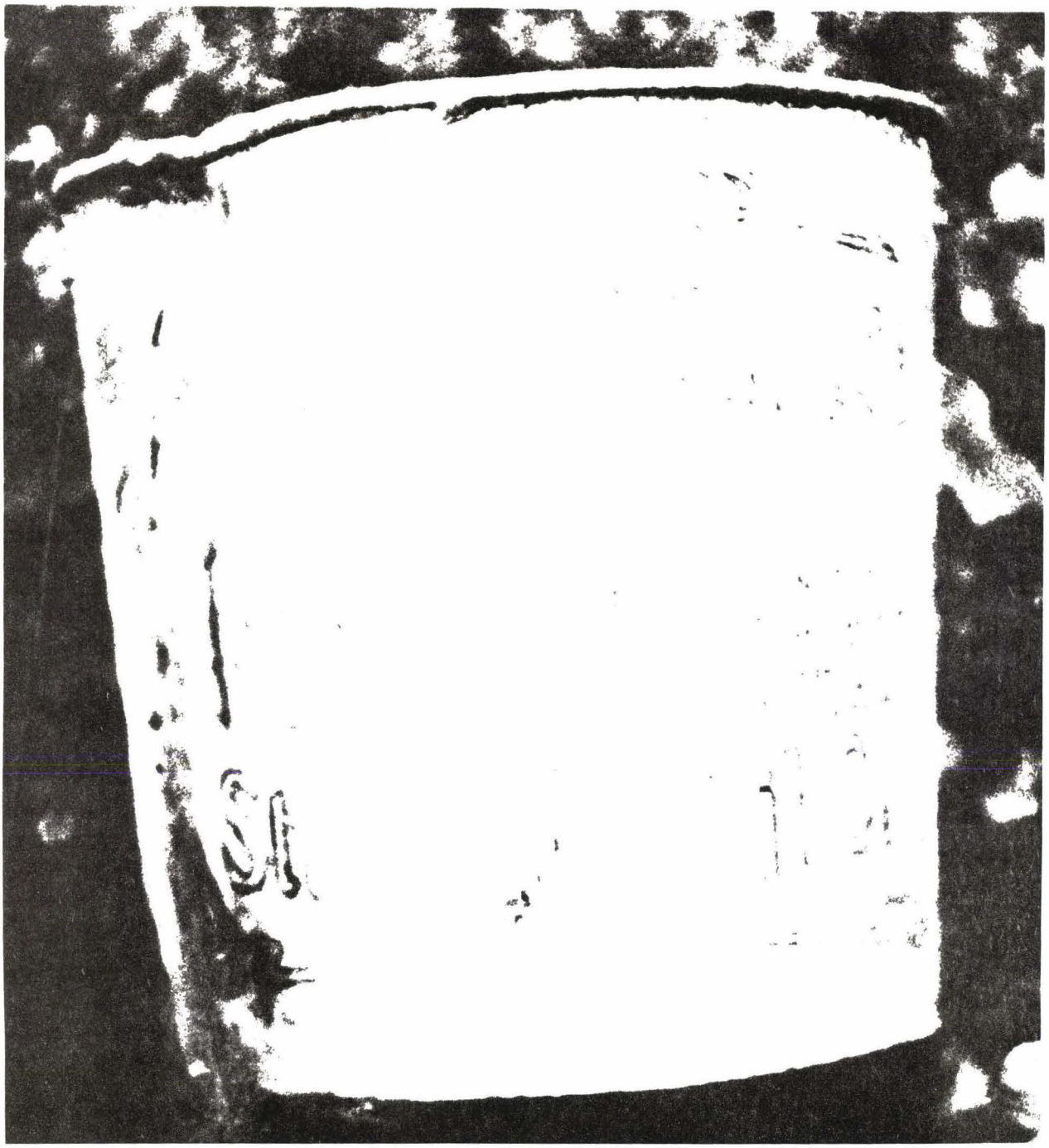


Figure 41, Grease bucket from the head of the Daveggio Creek chute.

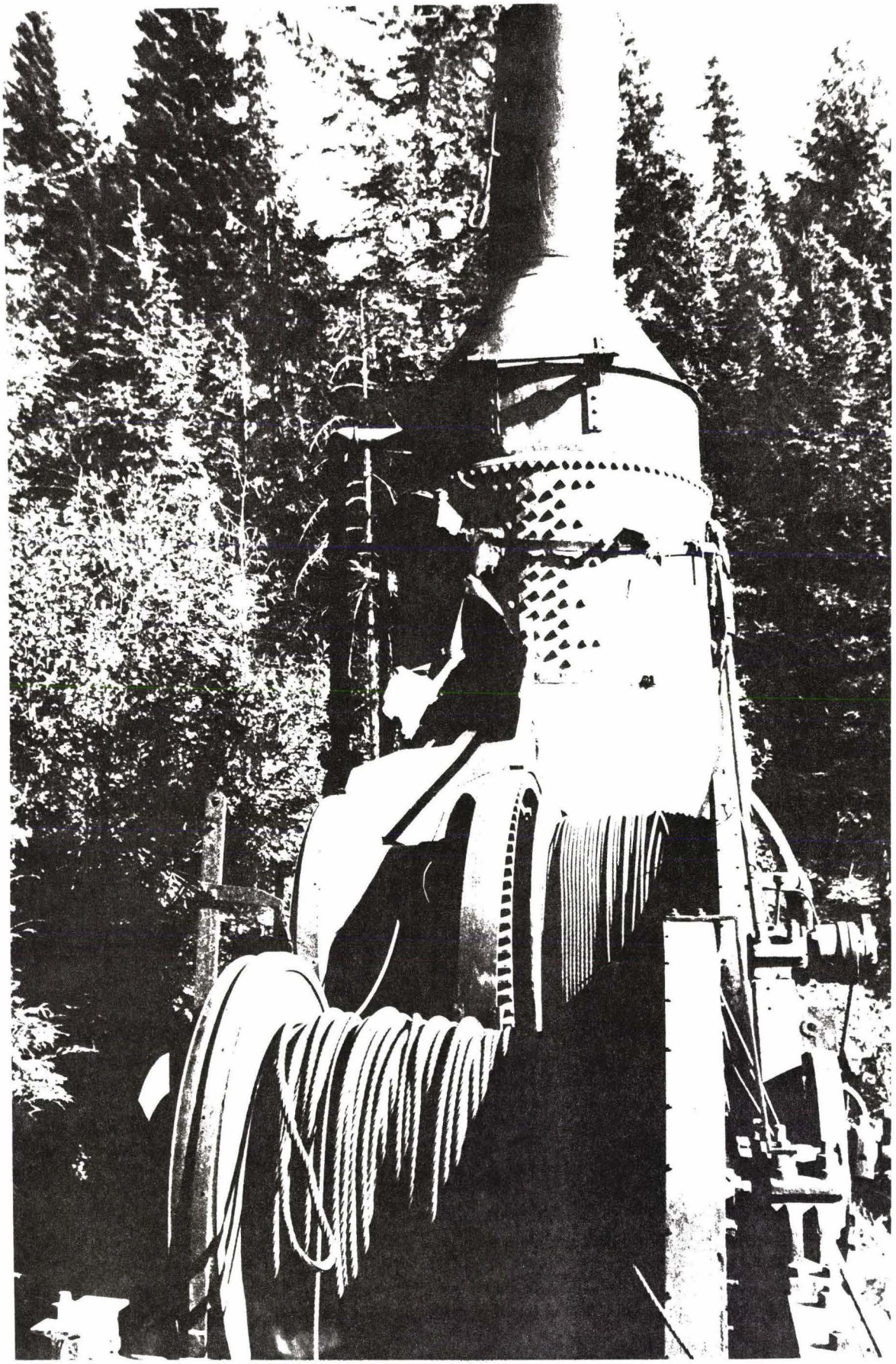


Figure 42, Steam donkey engine located at the end of the Hobo Creek log chute.

10. Log Chutes and History

The logging industry began major developments in north Idaho in about 1900. Large lumber companies, principally from the Great Lakes area, moved quickly to secure large tracts of timberland in the Idaho Panhandle. The competition for good stands became acute and sometimes led to violence. The easily accessible trees were soon obtained and more and more difficult areas were logged.

The hundreds of miles of log chutes built every year were an expression of this intense competition for merchantable timber, particularly white pine. This competition led to the use of an expedient technology, which was used until the resource was depleted in an area, then discarded. This type of exploitation of the environment was in keeping with the prevailing Victorian attitudes of competitiveness and conspicuous consumption (Hardesty 1980:75).

Log chute construction was relatively inexpensive in the early 1900's. However, the large amounts of timber needed to build them (about 100,000 board feet per mile according to Berry 1917:36) and the damage done to logs going over them (Anderson 1930) became increasingly intolerable as the 20th century progressed. Near the height of the use of log chutes in north Idaho, Neff made the following assessment:

> The advantages of chutes are that they can be used on steep grades and over rough ground to cut down skidding distances. Their disadvantages are (1) the expense caused by difficulty of control in their operation, (2) depreciation of the logs caused by breakage, brooming, goose-neck marks and holding logs in rollaways till weather conditions are favorable for chuting, (3) the large investment necessary for their construction with no residual value to the operating company of the forest property, and (4) the timber used in their construction and left on the ground. The last item, although of little consequence now, amounts to 25 million feet per year, enough to keep an average band mill going (1927:160).

To put this in perspective, the Idaho Panhandle National Forests' average annual timber cut has fluctuated between 270 and 321 million board feet since 1977. That means that log chute construction would consume between 7 to 9 percent of today's harvest at the rate chutes were constructed in the 1920's. If the 4 to 6 percent loss of volume, due to chute-caused damage to logs, is included, the total loss could be as high as 11 to 15 percent.

The 1930's saw not only a collapse of the lumber market but also an increased awareness of the need for conservation. The viability of log chutes in comparison with other forms of transportation became increasingly tenuous. Even as early as 1927, railroad grades, truck-road grades, truck pole roads, and tractor roads could be constructed at an average cost equal to or better than log chutes (Neff 1927:160). On this basis, Neff made the recommendation that:

> Chutes can be profitably displaced in many cases with the use of tractors, trucks, and railroad spurs. Tractors with bummers and steel "cat pans" or by dragging whole trees on the ground are now replacing chutes with success in the yellow pine and fir-larch types. Auto trucks, both on graded roads and pole roads, are replacing chutes throughout the region. The costs and outputs of log chutes in comparison with other means of transportation are not as favorable as is often supposed by loggers (1927:160).

This advice was taken to heart in the 1930's. Truck roads were greatly extended in forested areas by organizations such as the W.P.A. and the C.C.C. By 1940, log chutes were no longer used in north Idaho.

Students of technology have advanced many ideas to explan why and how technology changes. A good example is James Gander's (1977:6) statement that:

> Technological innovations result in reducing the real cost (in terms of labor, capital, and other resources) of supplying raw materials.

This proposition could help explain both the initial adoption and the eventual abandonment of log chutes by the logging industry. It is with just such propositions that archeologists should apply their knowledge of historic technology. The causes and consequences of technological change has great significance in today's economy. The study of log chutes and logging technology in general can make a contribution to our understanding of technological change and could be relevant to the solution of problems we now face in our economy.

GLOSSARY

Apron — A platform built of timbers at the foot of a log chute, which guides in the desired direction logs leaving the chute (Committee of the Society of American Foresters 1918:2).

Beats — Sections of a trailing chute where teamsters were assigned to pull logs over (Neff 1927:158).

Bear Trap — A log, one end of which is pivoted to a framework erected above a log chute. The free end drags on top of logs which pass under it in the chute (Bryant 1913:240).

Chute Spike — A 8 to 16 inch long, ½ to 3/4 inch square iron spike with a hammered head. The head usually resembles a faceted dome.

Chute Sticks — Logs secured to cross ties or embedded in the ground which form the sides of the chute channel.

Corduroy Road — A roadway having logs laid side-by-side across it, as in marshy places (Committee of the Society of American Foresters 1918:14).

Crib — One of the supports under a log chute built of round logs laid in crib fashion (Committee of the Society of American Foresters 1918:15).

Cross Ties — Short supports on which the chute sticks are secured.

Donkey Chute — (fore-and-aft chute). A chute built to be trailed with donkey engines and usually built heavier and straighter than other log chutes.

Fender Pole — A log attached to the top of a chute stick to make the chute channel deeper and to keep logs in the chute.

Gooseneck A curved iron put in the bottom of a log chute to check the speed of descending logs (Committee of the Society of American Foresters 1918:27).

Greaser One who applies grease to a log chute (Committee of the Society of American Foresters 1918:28).

Head The top end of a chute.

J Hook A hook, with a recurved head in the shape of the letter J. The J hook is fastened to the top of the forward draft. If the logs start to run, the draft animals can be automatically freed by turning them at right angles to the road (Committee of the Society of American Foresters 1918:33).

Log Chute Any timber channel in which logs are transported. Types of log chutes include two pole, three pole or four pole (depending on the number of chute sticks forming the channel), hewn or unhewn chute, ground chute (which is basically a ditch running downhill), saw-timber chute (made of sawn timbers), and roller chute (which incorporated rollers in the sides of the channel).

Rollaway A platform usually tilted away from the log chute onto which logs are unloaded out of the chute.

Roughlock (chain riprap). Chain nailed to the sides of a chute channel to slow down descending logs.

Running Chute (gravity chute). A chute in which logs move under the force of gravity.

Skidway Two skids laid parallel at right angles to a chute, usually raised above the ground at the end nearest the chute. Logs were usually piled upon a skidway, as they were brought from the stump for loading into the chute.

Slip The portion of a log chute between the top and the bottom.

Sniped To round off the end of a log to make it slide easily (Committee of the Society of American Foresters 1918:42).

Tongs A pair of hooks attached by links to a ring and used for skidding logs (Committee of the Society of American Foresters 1918:42).

Tow Path A earth or corduroy path paralleling a log chute used by horses or tractors to tow logs in the chute.

Trail A group of 2 or more logs traveling together in a chute.

Trail Chute (tow chute). A chute in which logs are moved by pulling them with horses, tractors, or steam donkeys.

Trailing Chute (tow chute). A chute in which logs are moved by pulling them with horses, tractors, or steam donkeys.

Wild Catting Letting logs slide down a gravity chute one at a time (Neff 1927:158).

Whip-poor-will A small log or board fastened diagonally across a log chute and used to shunt logs out of the chute (Committee of the Society of American Foresters 1918:73).

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